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## **CHAPTER 4**

# **Historical Basinwide Emissions and Air Quality**

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## *Introduction*

This chapter includes information about historical emission and air quality trends in California's five most populated air basins: the South Coast Air Basin, the San Francisco Bay Area Air Basin, the San Joaquin Valley Air Basin, the San Diego Air Basin, and the Sacramento Valley Air Basin. The primary focus of the chapter is ozone, PM<sub>10</sub>, and carbon monoxide. However, information on nitrogen dioxide is included for the South Coast Air Basin and San Diego Air Basin because these areas were once designated as nonattainment for NO<sub>2</sub>. However, both areas now attain the nitrogen dioxide standards.

The introduction section for each air basin includes a description of the area, a discussion of the emission trends for each pollutant, and a description of the changes in population and the number of vehicle miles traveled each day in the air basin. This introduction is followed by more detailed discussions of trends in emissions by major source categories and ambient air quality, organized by pollutant.

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## *South Coast Air Basin*

### Introduction – Area Description

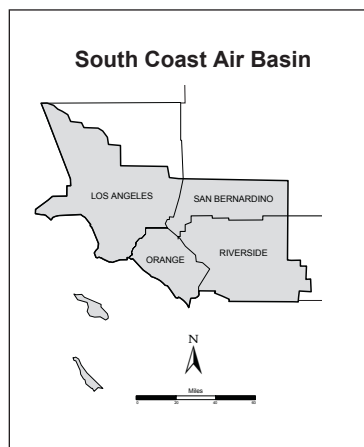


Figure 4-1

The South Coast Air Basin is California's largest metropolitan region. The area includes the southern two-thirds of Los Angeles County, all of Orange County, and the western urbanized portions of Riverside and San Bernardino counties. It covers a total of 6,530 square miles, is home to nearly half of California's population, and generates about one-third of the State's total criteria pollutant emissions. The South Coast Air

Basin generally forms a lowland plain, bounded by the Pacific Ocean on the west and by mountains on the other three sides. In terms of air pollution potential, there are probably few areas less suited for urban development. The warm sunny weather associated with a persistent high pressure system is conducive to the formation of ozone, commonly referred to as "smog." The problem is further aggravated by the surrounding mountains, frequent low inversion heights, and stagnant air conditions. All of these factors act together to trap pollutants in the Basin. Pollutant concentrations in parts of the South Coast Air Basin are among the highest in California. As a result, controlling the contributing emission sources poses a great challenge to State and local air pollution control agencies.

Basin generally forms a lowland plain, bounded by the Pacific Ocean on the west and by mountains on the other three sides.

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## *South Coast Air Basin* **Emission Trends**

Overall, since 1985 the emission levels for all pollutants in the South Coast Air Basin are decreasing. The decreases are predominantly due to motor vehicle controls and reductions in evaporative emissions. In the South Coast Air Basin, on-road motor vehicles are by far the largest contributors to CO, NO<sub>x</sub>, and ROG emissions. Other mobile sources are also significant contributors to CO and NO<sub>x</sub> emissions.

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## *South Coast Air Basin*

### **Population and VMT**

Both population and the daily number of vehicle miles traveled, or VMT, grew at high rates in the South Coast Air Basin from 1980 to 1997. The population increased 37 percent — from 10.4 million in 1980 to more than 14 million in 1997. During the same 17-year period, the number of vehicle miles traveled each day increased about 75 percent — from 177 million miles per day in 1980 to nearly 310 million miles per day in 1997. While high growth rates are often associated with corresponding increases in emissions and pollutant concentrations, aggressive emission control programs in the South Coast Air Basin have resulted in emission decreases and a continuing improvement in air quality.

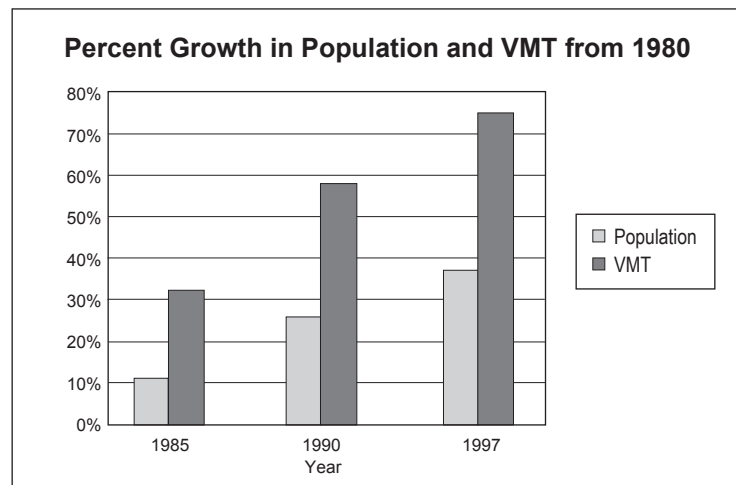


Figure 4-2

## South Coast Air Basin

### Ozone Precursor Emission Trends

Emissions of the ozone precursors NO<sub>x</sub> and ROG in the South Coast Air Basin are generally following the statewide downward trend. Motor vehicle miles traveled in the basin are increasing, but NO<sub>x</sub> and ROG emissions from on-road vehicles are dropping as more stringent vehicle emission standards have been adopted. NO<sub>x</sub> emissions from electric utilities in the basin have declined substantially since 1975, despite a nationwide increase in emissions from electric utilities in the same time period. These large reductions are primarily due to increased use of natural gas as the principal fuel for power plants and control rules that limit NO<sub>x</sub> emissions.

NO <sub>x</sub> Emission Trends (tons/day, annual average)			
Emission Source	1985	1990	1995
<b>All Sources</b>	<b>1395</b>	<b>1384</b>	<b>1214</b>
Stationary Sources	221	164	136
Area-wide Sources	61	45	37
On-Road Mobile	883	929	791
Gasoline Vehicles	695	669	581
Diesel Vehicles	188	260	210
Other Mobile Sources	230	246	250

Table 4-1

ROG Emission Trends (tons/day, annual average)			
Emission Source	1985	1990	1995
<b>All Sources</b>	<b>1774</b>	<b>1535</b>	<b>1221</b>
Stationary Sources	369	349	284
Area-wide Sources	259	244	198
On-Road Mobile	1043	830	616
Gasoline Vehicles	1020	796	589
Diesel Vehicles	23	34	27
Other Mobile Sources	103	112	123

Table 4-2

## South Coast Air Basin

### Ozone Precursor Emission Trends

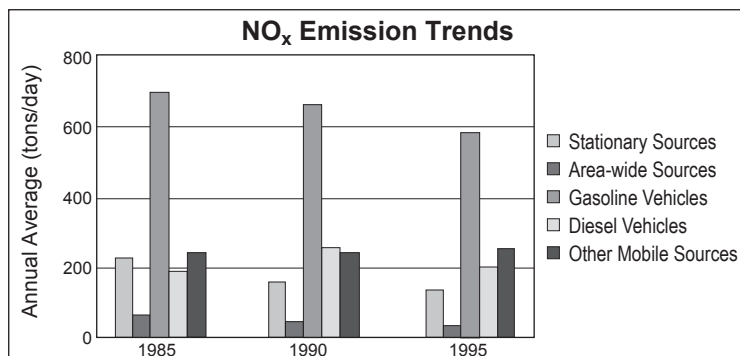


Figure 4-3

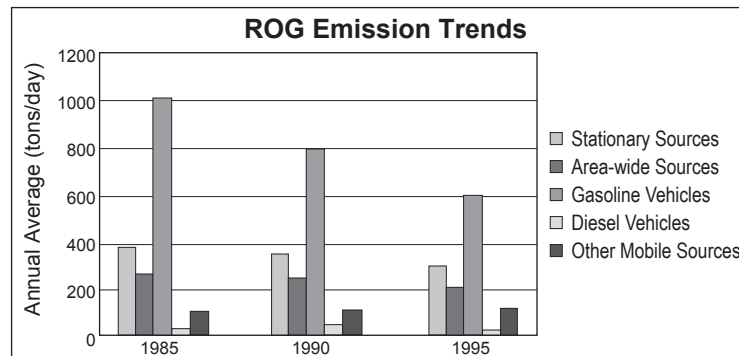


Figure 4-4

## *South Coast Air Basin* Ozone Air Quality Trend

Air quality as it relates to ozone in the South Coast Air Basin has improved substantially over the last 30 years. During the 1960s, concentrations above 0.60 parts per million were not uncommon. Today, the maximum measured concentrations are less than half that. All of the ozone statistics show a steady decline. The 1997 peak indicator value is about 50 percent of the 1980 value. The maximum 1-hour concentration has decreased by more than 50 percent. The number of days above the standards has declined dramatically, as well as the number of episode days. Stage I and Stage II episodes occur when a 1-hour concentration reaches 0.20 ppm and 0.35 ppm, respectively. The last Stage II episode occurred in 1986. While Stage I episodes still occur, the number has been reduced from close to 100 during the early 1980s to only one during 1997.

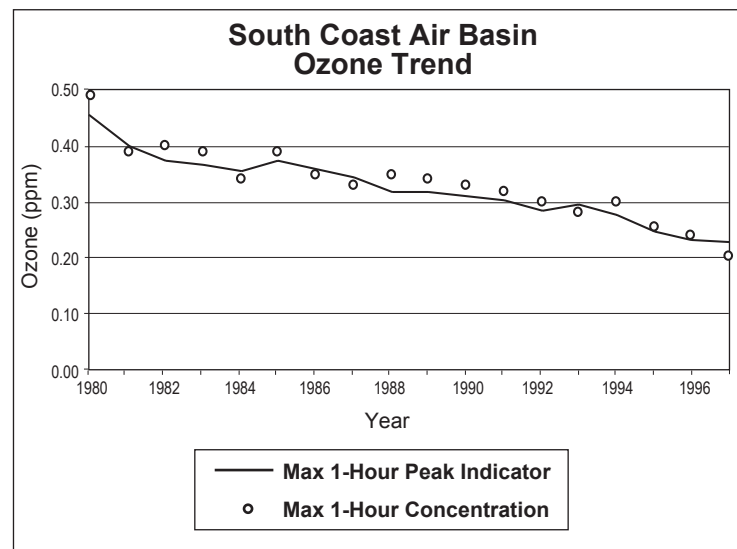


Figure 4-5

# South Coast Air Basin

## Ozone Air Quality Table

### Ozone (ppm)

OZONE (ppm)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Peak Indicator	0.451	0.401	0.373	0.365	0.354	0.375	0.360	0.344	0.319	0.320	0.310	0.304	0.286	0.297	0.279	0.249	0.233	0.229
National 1-Hour Design Value	0.430	0.420	0.390	0.360	0.360	0.360	0.350	0.350	0.340	0.330	0.330	0.310	0.300	0.300	0.280	0.250	0.231	0.215
National 8-Hour Design Value	0.271	0.240	0.231	0.239	0.216	0.234	0.226	0.193	0.199	0.191	0.176	0.183	0.184	0.173	0.164	0.166	0.155	0.135
Maximum 1-Hour Concentration	0.490	0.390	0.400	0.390	0.340	0.390	0.350	0.330	0.350	0.340	0.330	0.320	0.300	0.280	0.300	0.256	0.239	0.205
Maximum 8-Hour Concentration	0.337	0.283	0.266	0.258	0.249	0.288	0.251	0.210	0.259	0.253	0.194	0.204	0.219	0.195	0.208	0.204	0.174	0.149
Days Above State Standard	210	233	198	192	209	207	217	196	216	211	185	184	190	185	165	153	141	144
Days Above Nat. 1-Hour Standard	167	187	151	153	175	158	167	160	178	157	131	130	142	124	118	98	85	64

Table 4-3

## South Coast Air Basin

### PM<sub>10</sub> Emission Trends

Direct emissions of PM<sub>10</sub> were relatively flat in the South Coast Air Basin between 1985 and 1995. A decrease in emissions would have been observed if not for growth in emissions from area-wide sources, primarily fugitive dust from paved and unpaved roads. A PM<sub>10</sub> State Implementation Plan has been adopted for the basin. Control measures adopted in support of this plan are expected to reduce PM<sub>10</sub> emissions in the future.

PM <sub>10</sub> Emission Trends (tons/day, annual average)			
Emission Source	1985	1990	1995
<b>All Sources</b>	<b>503</b>	<b>549</b>	<b>496</b>
Stationary Sources	33	36	33
Area-wide Sources	414	459	421
On-Road Mobile	42	39	28
Gasoline Vehicles	12	9	10
Diesel Vehicles	30	30	18
Other Mobile Sources	14	15	14

Table 4-4

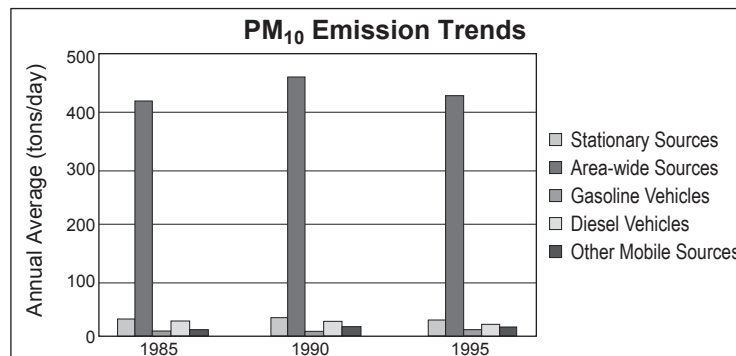


Figure 4-6

## *South Coast Air Basin* **PM<sub>10</sub> Air Quality Trend**

As with other pollutants, the PM<sub>10</sub> statistics show overall improvement. During the period for which data are available, the maximum annual geometric mean decreased 31 percent. Despite this decrease, ambient concentrations still exceed both the State and the national annual PM<sub>10</sub> standards. The number of days above the 24-hour PM<sub>10</sub> standards also dropped. During 1988, there were 65 days above the State standard and 30 days above the national standard. By 1997, there were still 54 State standard exceedance days, but only 6 national standard exceedance days.

PM<sub>10</sub> continues to pose a significant problem in the South Coast Air Basin. While emission controls implemented for ozone will also benefit PM<sub>10</sub>, more controls aimed specifically at reducing PM<sub>10</sub> will be needed to reach attainment.

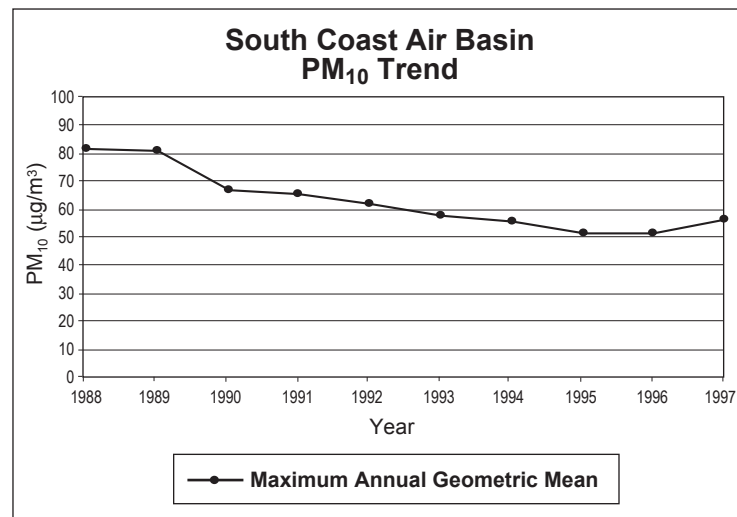


Figure 4-7

## *South Coast Air Basin*

### **PM<sub>10</sub> Air Quality Table**

#### **PM<sub>10</sub> (µg/m<sup>3</sup>)**

PM <sub>10</sub> (µg/m <sup>3</sup> )	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Maximum 24-Hour Concentration									289	271	475	179	649	231	161	219	162	227
Maximum Annual Geometric Mean									81.8	81.3	66.9	65.5	62.4	58.0	56.0	51.8	52.0	56.3
Days Above State 24-Hour Standard									65	67	65	56	52	61	58	51	51	54
Calc. Days Above Nat. 24-Hour Std.									30	33	18	12	12	18	6	24	6	6

Table 4-5

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## South Coast Air Basin

### Carbon Monoxide Emission Trends

Emissions of CO have been trending downward since 1985 in the South Coast Air Basin even though motor vehicle miles traveled have increased and industrial activity has grown. On-road motor vehicle controls are primarily responsible for this decline in emissions of CO. Stationary source emissions decreased during the 1970s and 1980s as a result of a decline in the manufacture of carbon black (a material used in the manufacture of tires) and steel in the South Coast Air Basin. CO emissions from other mobile sources have increased due in part to larger populations of off-road recreational vehicles and boats.

CO Emission Trends (tons/day, annual average)			
Emission Source	1985	1990	1995
<b>All Sources</b>	<b>9941</b>	<b>8936</b>	<b>7212</b>
Stationary Sources	34	39	39
Area-wide Sources	233	272	268
On-Road Mobile	8587	7430	5542
Gasoline Vehicles	8509	7294	5413
Diesel Vehicles	78	136	129
Other Mobile Sources	1087	1195	1363

Table 4-6

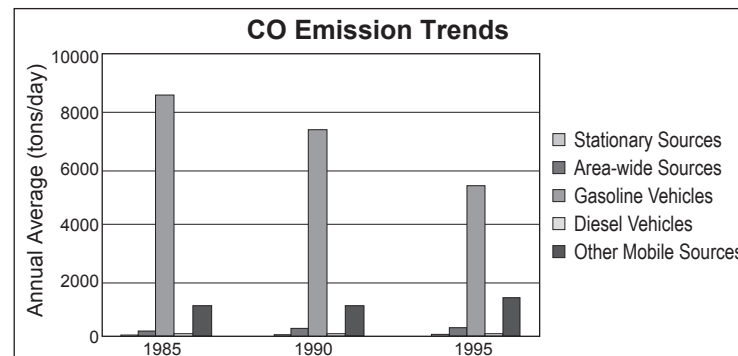


Figure 4-8

## *South Coast Air Basin*

### Carbon Monoxide Air Quality Trend

Carbon monoxide concentrations in the South Coast Air Basin have decreased markedly — a total decrease of 35 percent in the maximum peak 8-hour value since 1980. The number of standard exceedance days has also declined. There were more than 90 days above the State and the national standards during 1980. However, during 1997, there were only 16 State standard exceedance days and 12 national standard exceedance days.

While the South Coast Air Basin is designated as nonattainment, violations of the State and national standards are now limited to only a small portion of Los Angeles County. No violations have occurred in the other three counties since 1992. Continued reductions in motor vehicle emissions should eventually bring the entire area into attainment.

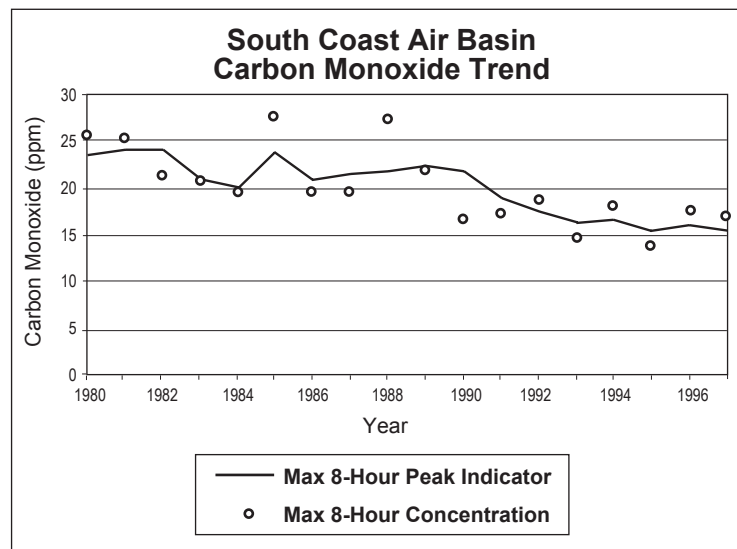


Figure 4-9

# *South Coast Air Basin*

## Carbon Monoxide Air Quality Table

### Carbon Monoxide (ppm)

<b>CARBON MONOXIDE (ppm)</b>	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Peak Indicator	23.7	24.1	24.1	21.0	20.3	24.0	21.1	21.7	21.9	22.5	21.9	19.0	17.7	16.5	16.7	15.6	16.1	15.5
Maximum 1-Hour Concentration	31.0	31.0	27.0	31.0	29.0	33.0	27.0	26.0	32.0	31.0	24.0	30.0	28.0	21.0	24.9	16.8	22.5	19.2
Maximum 8-Hour Concentration	25.8	25.5	21.3	20.9	19.7	27.7	19.7	19.6	27.5	21.8	16.8	17.4	18.8	14.6	18.2	13.8	17.5	17.1
Days Above State 8-Hour Standard	98	84	71	60	73	64	56	43	66	70	47	44	32	24	28	18	23	16
Days Above Nat. 8-Hour Standard	94	76	69	53	67	53	49	39	58	64	44	39	28	19	20	14	17	12

Table 4-7

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## South Coast Air Basin

### Nitrogen Dioxide

#### Oxides of Nitrogen Emission Trends

NO<sub>x</sub> (and nitrogen dioxide) emissions in the South Coast Air Basin have declined between 1985 and 1995. This downward trend should continue as more stringent motor vehicle and stationary source emissions standards are adopted.

NO <sub>x</sub> Emission Trends (tons/day, annual average)			
Emission Source	1985	1990	1995
<b>All Sources</b>	<b>1395</b>	<b>1384</b>	<b>1214</b>
Stationary Sources	221	164	136
Area-wide Sources	61	45	37
On-Road Mobile	883	929	791
Gasoline Vehicles	695	669	581
Diesel Vehicles	188	260	210
Other Mobile Sources	230	246	250

Table 4-8

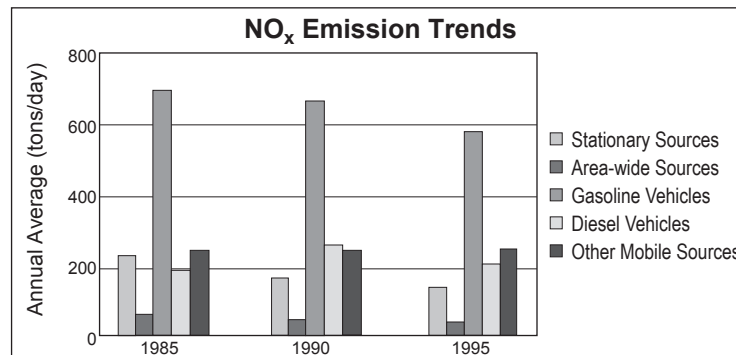


Figure 4-10

## *South Coast Air Basin*

### Nitrogen Dioxide Air Quality Trend

The South Coast Air Basin is one of only a few areas in California where nitrogen dioxide has been a problem. However, over the last 17 years, there has been a fairly steady decline in NO<sub>2</sub> values. The maximum peak 1-hour indicator for 1997 was nearly half what it was during 1980. Nitrogen dioxide concentrations in the South Coast area no longer exceed the State and national standards. Furthermore, the downward trend should continue in the future.

Nitrogen dioxide is formed from oxides of nitrogen emissions, which also contribute to ozone. As a result, the majority of the future emission control measures will be implemented as part of the overall ozone control strategy. Many of these control measures will target mobile sources, which account for about 75 percent of California's oxides of nitrogen emissions.

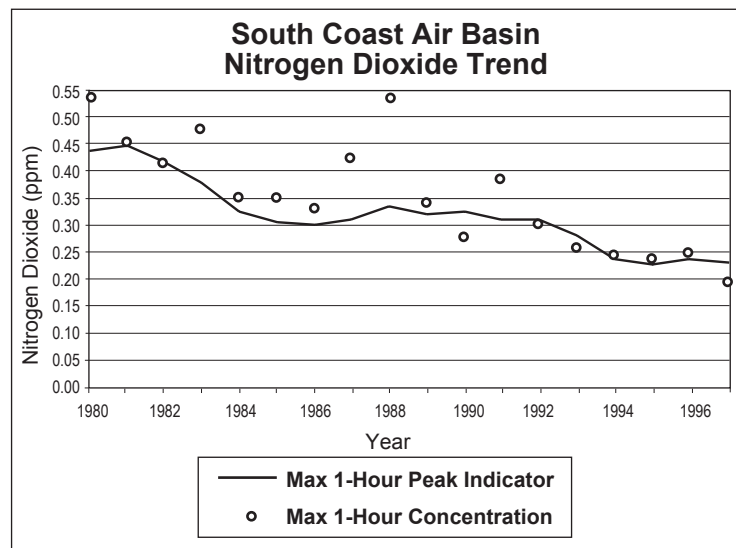


Figure 4-11

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## *South Coast Air Basin*

### Nitrogen Dioxide Air Quality Table

#### Nitrogen Dioxide (ppm)

NITROGEN DIOXIDE (ppm)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Peak Indicator	0.433	0.445	0.414	0.378	0.325	0.307	0.303	0.311	0.335	0.323	0.325	0.312	0.311	0.285	0.241	0.229	0.242	0.237
Maximum 1-Hour Concentration	0.540	0.450	0.410	0.470	0.350	0.350	0.330	0.420	0.540	0.340	0.280	0.380	0.300	0.260	0.247	0.239	0.250	0.200
Maximum Annual Average	0.071	0.071	0.062	0.059	0.057	0.060	0.061	0.055	0.061	0.057	0.055	0.055	0.051	0.050	0.050	0.046	0.048	0.043

Table 4-9

## *San Francisco Bay Area Air Basin*

### Introduction – Area Description

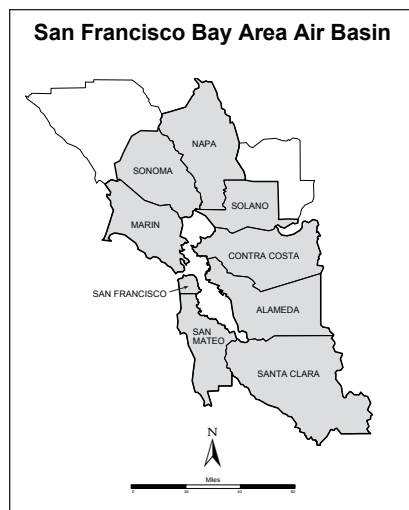


Figure 4-12

The San Francisco Bay Area is California's second largest metropolitan area and is the focal point of northern California. The nine county area comprises all of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, and Santa Clara counties, the southern half of Sonoma County, and the southwestern portion of Solano County. The unifying feature of the area is the Bay itself, oriented north-south and covering about 400 square miles of the area's total 5,540 square miles.

About 20 percent of California's population resides in the San Francisco Bay Area, and pollution sources in the region account for about 20 percent of the total statewide emissions. The climate in the San Francisco Bay Area varies from one location to the next. Along the coast, temperatures are mild year-round. However, as one moves inland, temperatures show larger diurnal and seasonal variations. Overall air quality in the San Francisco Bay Area Air Basin is better than in the South Coast Air Basin. This is due in part to a more favorable climate, with cooler temperatures and better ventilation. However, continued infrequent exceedances of the national ozone standard still pose a challenge to State and local air pollution control agencies.

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## *San Francisco Bay Area Air Basin* **Emission Trends**

The emission levels for all pollutants are trending downward in the San Francisco Bay Area Air Basin. On-road motor vehicles are the largest contributors to CO, ROG, and NO<sub>x</sub> emissions in the basin. The implementation of stricter motor vehicle emission standards will continue to decrease vehicle emissions in the basin. Controls on stationary source solvent evaporation and fugitive emissions will also continue to impact ROG emissions.

## *San Francisco Bay Area Air Basin* **Population and VMT**

Compared to the State's other urban areas, population and the number of vehicle miles traveled each day grew at a slower rate in the San Francisco Bay Area Air Basin from 1980 to 1997. During that 17-year period, the population increased about 27 percent — from about 5 million in 1980 to almost 6.5 million in 1997. During the same period, the daily VMT increased 43 percent — from nearly 87 million miles per day in 1980 to about 124 million miles per day in 1997. While these growth rates are about half the growth rates seen in the other urban areas, they still represent substantial increases.

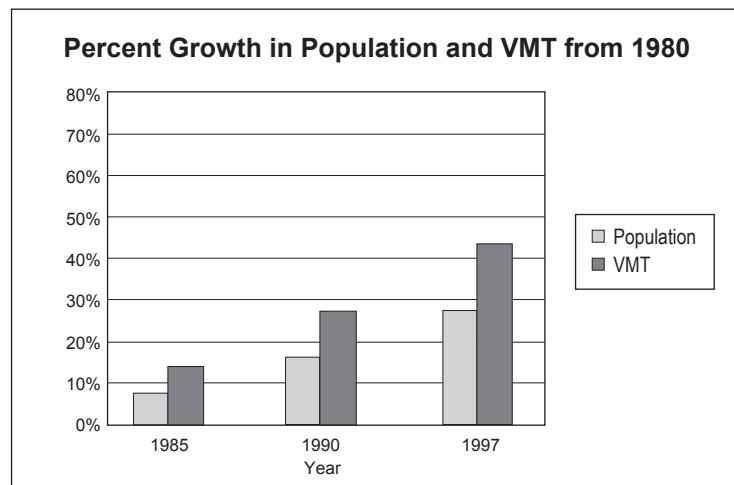


Figure 4-13

## *San Francisco Bay Area Air Basin* Ozone Precursor Emission Trends

Emissions of ozone precursors are decreasing in the San Francisco Bay Area Air Basin. The Bay Area has a significant motor vehicle population, and the implementation of stricter motor vehicle controls has resulted in significant emissions reductions for NO<sub>x</sub> and ROG. Stationary source emissions of ROG have declined over the last 20 years due to new controls for oil refinery fugitive emissions and new rules for control of ROG from various industrial coatings and solvent operations.

<b>NO<sub>x</sub> Emission Trends (tons/day, annual average)</b>			
<b>Emission Source</b>	<b>1985</b>	<b>1990</b>	<b>1995</b>
<b>All Sources</b>	<b>687</b>	<b>651</b>	<b>576</b>
Stationary Sources	150	121	110
Area-wide Sources	33	27	24
On-Road Mobile	413	403	337
Gasoline Vehicles	326	323	275
Diesel Vehicles	87	80	62
Other Mobile Sources	91	100	105

Table 4-10

<b>ROG Emission Trends (tons/day, annual average)</b>			
<b>Emission Source</b>	<b>1985</b>	<b>1990</b>	<b>1995</b>
<b>All Sources</b>	<b>921</b>	<b>721</b>	<b>557</b>
Stationary Sources	184	145	115
Area-wide Sources	157	124	98
On-Road Mobile	534	404	294
Gasoline Vehicles	524	395	287
Diesel Vehicles	10	9	7
Other Mobile Sources	46	48	50

Table 4-11

## San Francisco Bay Area Air Basin

### Ozone Precursor Emission Trends

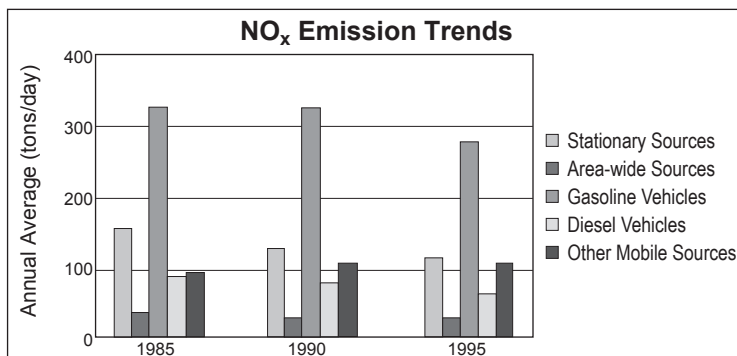


Figure 4-14

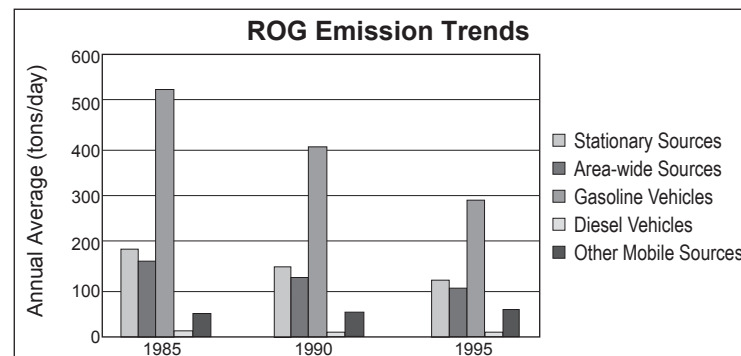


Figure 4-15

## *San Francisco Bay Area Air Basin* Ozone Air Quality Trend

Ozone concentrations in the San Francisco Bay Area are much lower than in the South Coast Air Basin. The peak ozone indicator declined about 20 percent from 1980 to 1997. Although the trend has not been consistently downward, the ambient concentrations generally declined from 1980 to 1994. Since 1994, the peak indicator values have risen. However, the data are limited, and it is not clear that these data represent a significant change in the overall trend.

The number of days above the State and national standards show a similar trend. The number of exceedance days generally decreased until the mid-1990s, increased during 1995 and 1996, and decreased again in 1997. More data are needed to determine whether the increases during 1995 and 1996 were anomalous, or whether they represent meteorology that will be frequently repeated.

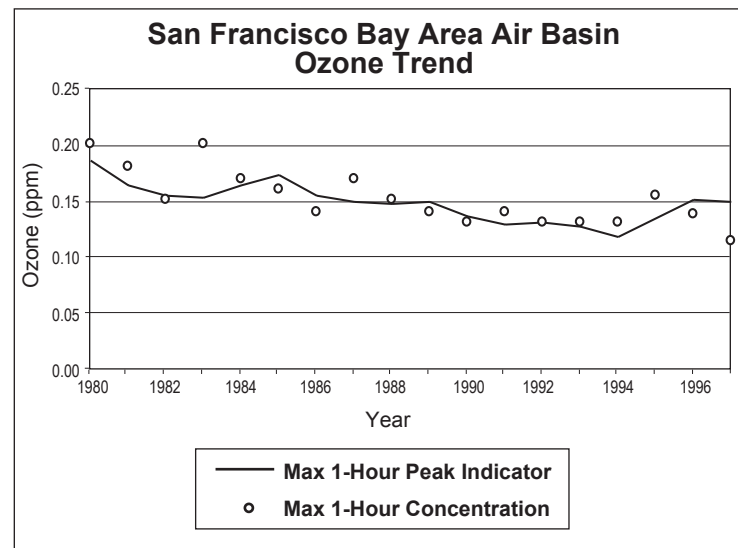


Figure 4-16

# San Francisco Bay Area Air Basin

## Ozone Air Quality Table

### Ozone (ppm)

OZONE (ppm)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Peak Indicator	0.186	0.162	0.154	0.153	0.164	0.173	0.155	0.149	0.147	0.148	0.136	0.129	0.130	0.126	0.117	0.135	0.151	0.149
National 1-Hour Design Value	0.190	0.190	0.180	0.160	0.160	0.160	0.150	0.140	0.140	0.140	0.130	0.130	0.120	0.120	0.121	0.138	0.138	0.138
National 8-Hour Design Value	0.115	0.098	0.093	0.110	0.110	0.095	0.093	0.106	0.096	0.094	0.088	0.086	0.083	0.083	0.083	0.099	0.099	0.072
Maximum 1-Hour Concentration	0.200	0.180	0.150	0.200	0.170	0.160	0.140	0.170	0.150	0.140	0.130	0.140	0.130	0.130	0.130	0.155	0.138	0.114
Maximum 8-Hour Concentration	0.150	0.124	0.109	0.150	0.124	0.128	0.106	0.116	0.101	0.103	0.105	0.109	0.101	0.113	0.097	0.115	0.113	0.085
Days Above State Standard	47	51	36	53	55	45	39	46	41	22	14	23	23	19	13	28	34	8
Days Above Nat. 1-Hour Standard	18	8	5	21	22	9	5	14	5	4	2	2	2	3	2	11	8	0

Table 4-12

## San Francisco Bay Area Air Basin PM<sub>10</sub> Emission Trends

Direct emissions of PM<sub>10</sub> increased slightly in the San Francisco Bay Area Air Basin between 1985 and 1995. This increase was due to growth in emissions from area-wide sources, primarily fugitive dust sources. Emissions of directly emitted PM<sub>10</sub> from motor vehicle exhaust decreased steadily between 1985 and 1995 due to new emissions standards.

PM <sub>10</sub> Emission Trends (tons/day, annual average)			
Emission Source	1985	1990	1995
<b>All Sources</b>	<b>183</b>	<b>188</b>	<b>193</b>
Stationary Sources	22	23	24
Area-wide Sources	138	147	154
On-Road Mobile	15	12	9
Gasoline Vehicles	4	3	4
Diesel Vehicles	11	9	5
Other Mobile Sources	8	6	6

Table 4-13

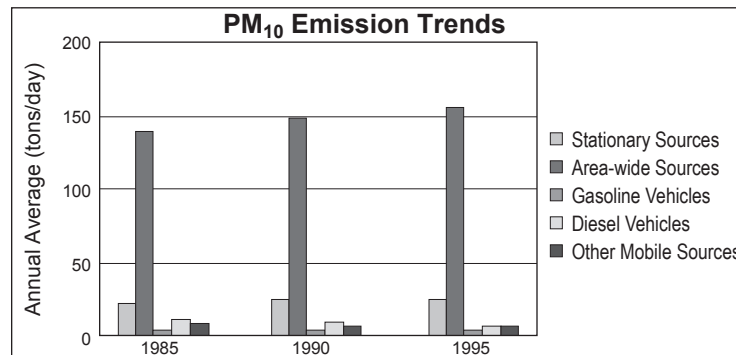


Figure 4-17

## *San Francisco Bay Area Air Basin* **PM<sub>10</sub> Air Quality Trend**

PM<sub>10</sub> is generally sampled only once every six days. As a result, there are fewer data on which to base historical trends. However, based on the data that are available, the annual geometric mean concentration declined about 32 percent from 1988 to 1997.

The data show that the annual State standard has not been exceeded for the last several years. Furthermore, exceedances of the State 24-hour standard dropped from 51 days during 1989 to only 4 days during 1997. The national 24-hour standard was last exceeded in 1991. Because many of the same sources contribute to both ozone and PM<sub>10</sub>, future ozone precursor emission controls should help ensure continued PM<sub>10</sub> improvements.

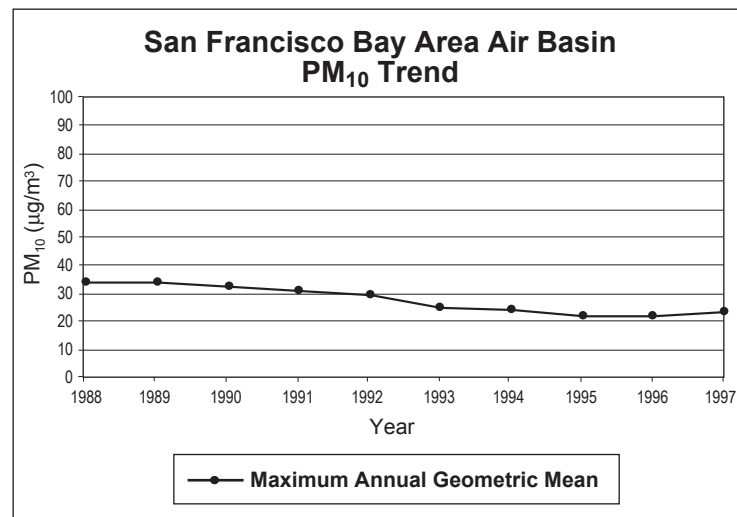


Figure 4-18

## *San Francisco Bay Area Air Basin*

### PM<sub>10</sub> Air Quality Table

PM<sub>10</sub> (µg/m<sup>3</sup>)

PM <sub>10</sub> (µg/m <sup>3</sup> )	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Maximum 24-Hour Concentration									146	150	173	155	112	101	97	74	76	95
Maximum Annual Geometric Mean									34.6	34.4	33.0	31.5	29.5	25.1	24.8	22.1	22.1	23.7
Days Above State 24-Hour Standard									32	51	34	36	19	11	10	7	3	4
Calc. Days Above Nat. 24-Hour Std.									0	0	6	3	0	0	0	0	0	0

Table 4-14

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## San Francisco Bay Area Air Basin Carbon Monoxide Emission Trends

Emissions of CO have declined in the San Francisco Bay Area Air Basin over the last 10 years. Motor vehicles and other mobile sources are the largest source of CO emissions in the basin. Emissions from motor vehicles have been declining, with the introduction of new automotive emission controls, despite increases in Vehicle Miles Traveled (VMT). Oil refinery processes contribute a significant portion of the stationary source CO emissions.

CO Emission Trends (tons/day, annual average)			
Emission Source	1985	1990	1995
<b>All Sources</b>	<b>5151</b>	<b>4593</b>	<b>3711</b>
Stationary Sources	46	48	48
Area-wide Sources	202	211	212
On-Road Mobile	4479	3862	2917
Gasoline Vehicles	4445	3824	2881
Diesel Vehicles	34	38	36
Other Mobile Sources	424	472	534

Table 4-15

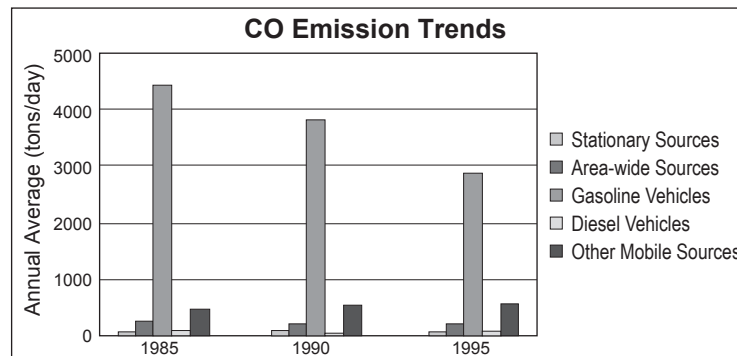


Figure 4-19

## *San Francisco Bay Area Air Basin* Carbon Monoxide Air Quality Trend

As in other areas of the State, carbon monoxide concentrations in the San Francisco Bay Area Air Basin have declined substantially over the last 17 years. The peak 8-hour indicator value during 1997 was less than half what it was during 1980 and is now well below the level of the standards. In fact, neither the State nor the national standards have been exceeded in this area since 1991.

Much of the decline in ambient carbon monoxide concentrations can be attributed to the introduction of clean fuels and newer, cleaner motor vehicles. The San Francisco Bay Area Air Basin is currently designated as attainment for both the State and national CO standards. Based on emission projections, the area is expected to maintain its attainment status.

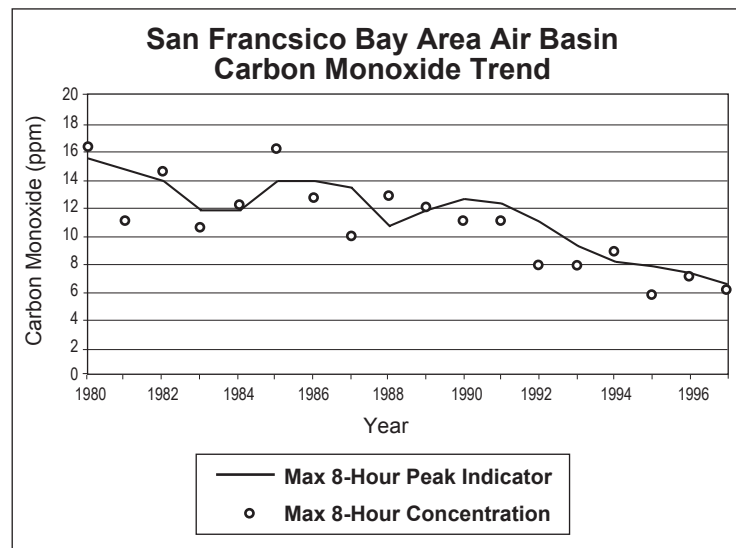


Figure 4-20

# *San Francisco Bay Area Air Basin*

## Carbon Monoxide Air Quality Table

### Carbon Monoxide (ppm)

CARBON MONOXIDE (ppm)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Peak Indicator	15.5	14.8	13.9	11.9	11.9	13.9	14.0	13.4	10.7	11.8	12.6	12.4	11.1	9.3	8.1	7.8	7.4	6.5
Maximum 1-Hour Concentration	27.0	16.0	18.0	17.0	20.0	21.0	20.0	17.0	15.0	19.0	18.0	15.0	12.0	14.0	12.0	10.1	8.8	10.7
Maximum 8-Hour Concentration	16.4	11.0	14.5	10.6	12.1	16.1	12.6	10.0	12.8	12.0	11.0	11.0	7.8	7.9	8.8	5.8	7.0	6.1
Days Above State 8-Hour Standard	17	5	13	4	8	20	8	2	4	10	4	5	0	0	0	0	0	0
Days Above Nat. 8-Hour Standard	12	4	11	4	7	17	8	1	4	9	2	4	0	0	0	0	0	0

Table 4-16

## *San Joaquin Valley Air Basin*

### Introduction – Area Description

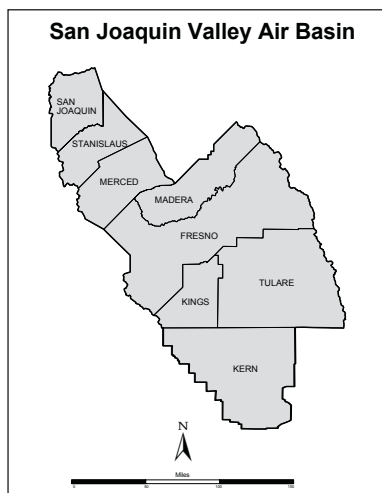


Figure 4-21

The San Joaquin Valley Air Basin occupies the southern two-thirds of California's Great Central Valley. The eight-county area comprises Fresno, Kings, Madera, Merced, San Joaquin, Stanislaus, and Tulare counties and the western portion of Kern County. The San Joaquin Valley spreads across nearly 25,000 square miles. With few exceptions, the Valley is flat and unbroken, with most of the area below 400 feet elevation.

The Valley floor slopes downward from east to west, and the San Joaquin River winds its way along the western side from south

to north. Similar to other inland areas, the San Joaquin Valley has cool wet winters and hot dry summers. Generally, the temperature increases and rainfall decreases from north to south.

In contrast to other California areas, air quality in the San Joaquin Valley is not dominated by emissions from one large urban area. Instead, there are a number of moderately sized urban areas spread along the main axis of the Valley. This wide distribution of emissions complicates the challenge faced by air quality control agencies. Overall, about 9 percent of California's population lives in the San Joaquin Valley, and pollution sources in the region account for about 14 percent of the total statewide emissions.

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## *San Joaquin Valley Air Basin* **Emission Trends**

Overall, the emission levels in the San Joaquin Valley Air Basin have been decreasing since 1985, with the exception of PM<sub>10</sub> emissions. The decreases are predominantly due to motor vehicle controls and reductions in evaporative and fugitive emissions. On-road motor vehicles are the largest contributors to CO and NO<sub>x</sub> emissions in the San Joaquin Valley. On-road motor vehicles, area-wide sources, and stationary sources are all significant contributors to ROG emissions. A significant portion of the stationary source ROG emissions are fugitive emissions from the extensive oil and gas production operations in the lower San Joaquin Valley. PM<sub>10</sub> emissions are mostly fugitive dust from paved and unpaved roads and agricultural operations.

## *San Joaquin Valley Air Basin* **Population and VMT**

Compared to California's other urban areas, the population and number of vehicle miles traveled each day in the San Joaquin Valley Air Basin grew at a much faster rate during the 1980 to 1997 time period. The population increased more than 50 percent — from nearly 2 million in 1980 to over 3 million in 1997. During the same period, the daily VMT more than doubled — from about 40 million miles per day in 1980 to over 84 million miles per day in 1997. Because these growth rates are so much higher than the growth rates in other areas, there has not been the same level of air quality improvement in the San Joaquin Valley Air Basin, especially with respect to ozone.

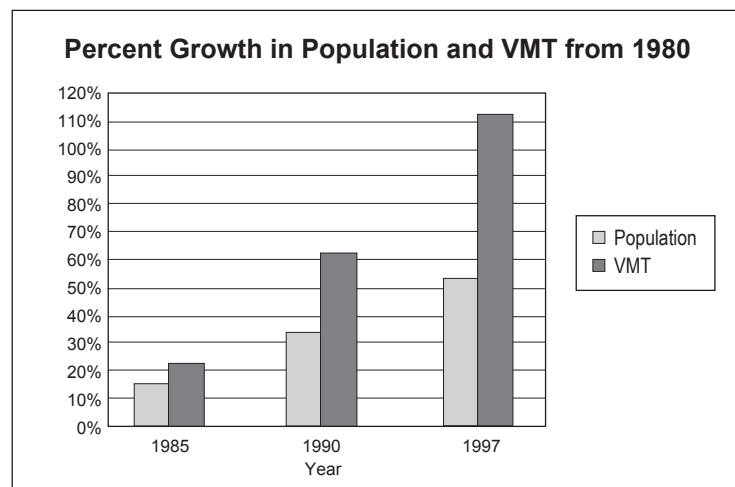


Figure 4-22

## *San Joaquin Valley Air Basin*

### **Ozone Precursor Emission Trends**

Emissions of the ozone precursors NO<sub>x</sub> and ROG are decreasing in the San Joaquin Valley Air Basin. Both stationary source and motor vehicle NO<sub>x</sub> emissions have been reduced by the adoption of more stringent emissions standards. Stricter standards have reduced ROG emissions from motor vehicles since 1985 even though vehicle miles traveled (VMT) have been increasing. Stationary and area-wide sources of ROG include petroleum production operations and the use of solvents. Stricter emissions standards and new controls have reduced the ROG emissions from these sources. Also, declining crude oil prices have resulted in cut-backs in oil production activities and an attendant decrease in ROG fugitive emissions.

<b>NO<sub>x</sub> Emission Trends (tons/day, annual average)</b>			
<b>Emission Source</b>	<b>1985</b>	<b>1990</b>	<b>1995</b>
<b>All Sources</b>	<b>605</b>	<b>606</b>	<b>540</b>
Stationary Sources	241	218	192
Area-wide Sources	15	14	12
On-Road Mobile	264	287	254
Gasoline Vehicles	172	202	189
Diesel Vehicles	92	85	65
Other Mobile Sources	85	87	82

Table 4-17

<b>ROG Emission Trends (tons/day, annual average)</b>			
<b>Emission Source</b>	<b>1985</b>	<b>1990</b>	<b>1995</b>
<b>All Sources</b>	<b>876</b>	<b>615</b>	<b>489</b>
Stationary Sources	210	128	99
Area-wide Sources	340	206	161
On-Road Mobile	286	238	188
Gasoline Vehicles	276	228	180
Diesel Vehicles	10	10	8
Other Mobile Sources	40	43	41

Table 4-18

## San Joaquin Valley Air Basin

### Ozone Precursor Emission Trends

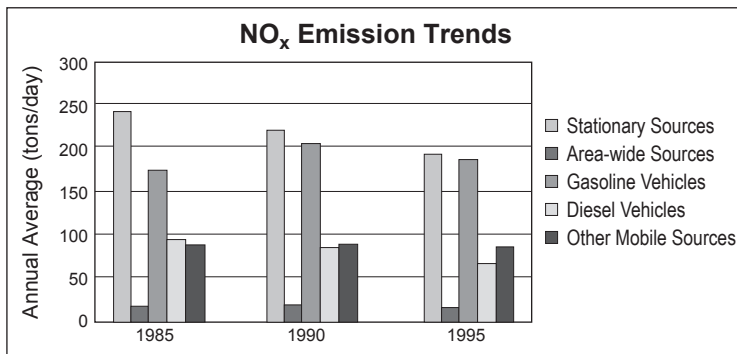


Figure 4-23

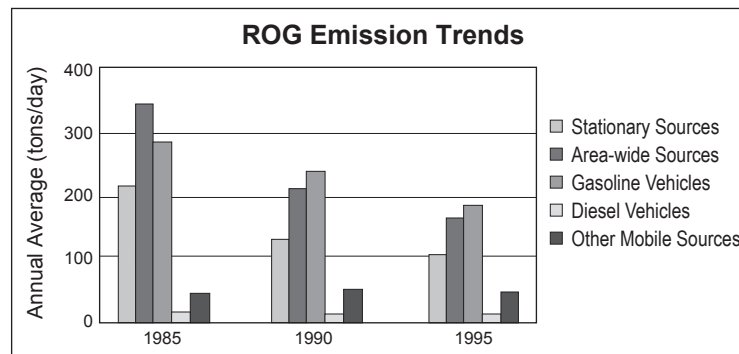


Figure 4-24

## *San Joaquin Valley Air Basin* **Ozone Air Quality Trend**

The San Joaquin Valley Air Basin has the second most severe ozone problem in the State. During 1980 through 1997, the maximum peak 1-hour indicator decreased slightly, on the order of 10 percent. The number of standard exceedance days has shown a comparable change. During 1980, there were 124 State standard exceedance days and 64 national standard exceedance days. This compares with 110 State standard exceedance days and 16 national standard exceedance days in 1997.

While air quality as related to ozone has improved throughout the State, the inland areas have generally shown less improvement than the coastal areas. This is due in part to the faster growth rates in the inland areas such as the San Joaquin Valley.

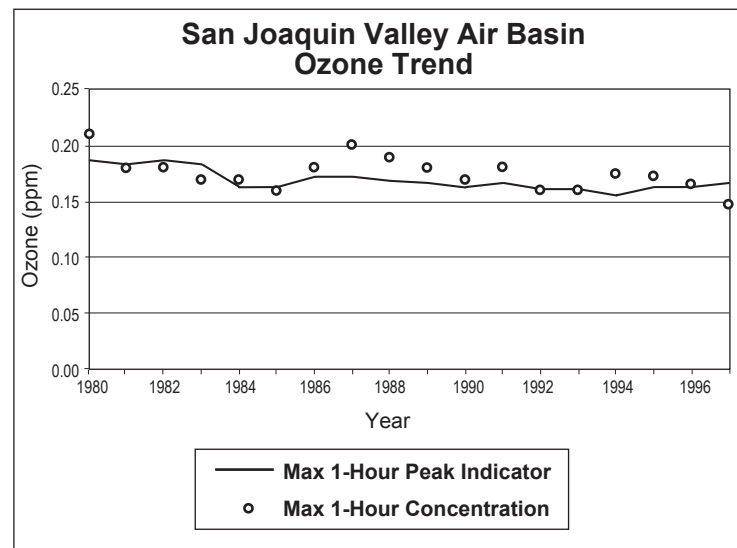


Figure 4-25

# *San Joaquin Valley Air Basin*

## Ozone Air Quality Table

Ozone (ppm)

OZONE (ppm)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Peak Indicator	0.188	0.183	0.187	0.184	0.164	0.163	0.172	0.172	0.169	0.168	0.164	0.167	0.162	0.162	0.156	0.163	0.164	0.167
National 1-Hour Design Value	0.180	0.180	0.170	0.170	0.160	0.160	0.170	0.170	0.170	0.170	0.160	0.160	0.160	0.160	0.160	0.165	0.165	0.164
National 8-Hour Design Value	0.125	0.128	0.124	0.110	0.116	0.115	0.125	0.126	0.120	0.120	0.119	0.119	0.110	0.118	0.118	0.124	0.127	0.116
Maximum 1-Hour Concentration	0.210	0.180	0.180	0.170	0.170	0.160	0.180	0.200	0.190	0.180	0.170	0.180	0.160	0.160	0.175	0.173	0.165	0.147
Maximum 8-Hour Concentration	0.141	0.149	0.134	0.123	0.136	0.132	0.135	0.150	0.128	0.136	0.124	0.130	0.121	0.125	0.129	0.134	0.137	0.127
Days Above State Standard	124	130	113	105	135	149	147	151	154	148	131	132	124	125	118	124	120	110
Days Above Nat. 1-Hour Standard	64	69	43	41	61	53	59	64	74	54	45	51	29	43	43	44	56	16

Table 4-19

## San Joaquin Valley Air Basin

### PM<sub>10</sub> Emission Trends

Direct emissions of PM<sub>10</sub> have increased slightly in the San Joaquin Valley Air Basin between 1985 and 1995. This increase has been due to growth in emissions from area-wide sources, primarily fugitive dust sources such as vehicle travel on unpaved and paved roads and agricultural operations. Emissions of directly emitted PM<sub>10</sub> from motor vehicles have decreased between 1985 and 1995 due to new diesel standards.

PM <sub>10</sub> Emission Trends (tons/day, annual average)			
Emission Source	1985	1990	1995
<b>All Sources</b>	<b>412</b>	<b>431</b>	<b>440</b>
Stationary Sources	26	27	28
Area-wide Sources	366	384	399
On-Road Mobile	13	12	9
Gasoline Vehicles	2	2	3
Diesel Vehicles	11	10	6
Other Mobile Sources	7	8	4

Table 4-20

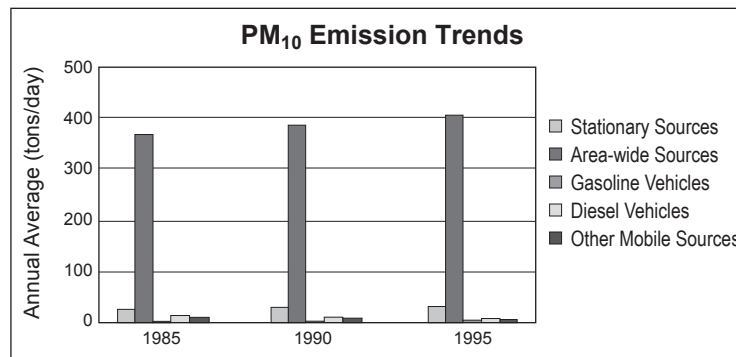


Figure 4-26

## *San Joaquin Valley Air Basin* **PM<sub>10</sub> Air Quality Trend**

The available PM<sub>10</sub> data show some variation during the eight-year period, but overall, there has been a downward trend. Part of the variation can be attributed to meteorology. Long periods of stagnation during the winter months allow PM<sub>10</sub> to accumulate over many days with resulting high concentrations. The maximum annual geometric mean shows a decrease of about 34 percent from 1988 to 1997. The number of days exceeding the State and national 24-hour standards also shows a decrease. There were 68 State standard exceedance days and 27 national standard exceedance days during 1988. During 1997, there were 48 State standard exceedance days and 6 national standard exceedance days. While ambient PM<sub>10</sub> concentrations appear to be declining, it will be a number of years before this area reaches attainment.

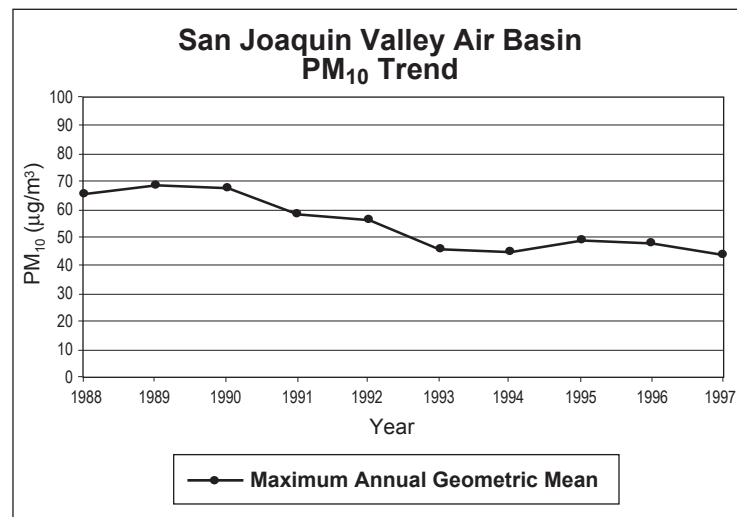


Figure 4-27

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## *San Joaquin Valley Air Basin*

### PM<sub>10</sub> Air Quality Table

PM<sub>10</sub> (µg/m<sup>3</sup>)

PM <sub>10</sub> (µg/m <sup>3</sup> )	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Maximum 24-Hour Concentration									244	250	439	279	183	239	190	279	153	199
Maximum Annual Geometric Mean									65.4	68.4	67.8	58.1	55.6	45.3	44.3	48.9	47.6	43.1
Days Above State 24-Hour Standard									68	66	79	70	66	53	62	76	59	48
Calc. Days Above Nat. 24-Hour Std.									27	36	30	24	6	18	12	9	0	6

Table 4-21

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## San Joaquin Valley Air Basin

### Carbon Monoxide Emission Trends

Emissions of CO have decreased between 1985 and 1995. Motor vehicles are by far the largest source of CO emissions. Emissions from motor vehicles have been declining since 1985, despite increases in vehicle miles traveled (VMT), with the introduction of new automotive emission controls and fleet turnover.

CO Emission Trends (tons/day, annual average)			
Emission Source	1985	1990	1995
<b>All Sources</b>	<b>3070</b>	<b>2951</b>	<b>2480</b>
Stationary Sources	50	56	59
Area-wide Sources	249	282	294
On-Road Mobile	2460	2269	1775
Gasoline Vehicles	2424	2227	1737
Diesel Vehicles	36	42	38
Other Mobile Sources	311	344	352

Table 4-22

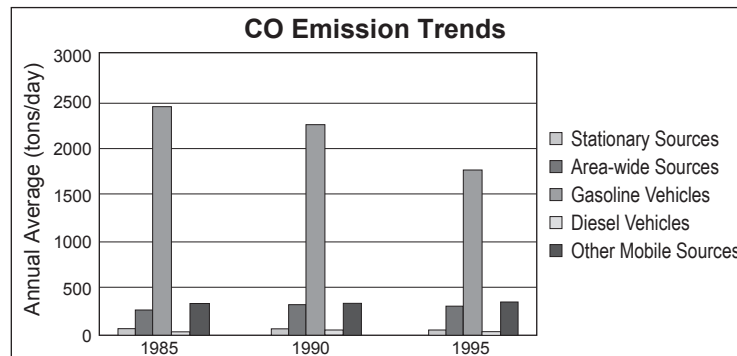


Figure 4-28

## *San Joaquin Valley Air Basin* Carbon Monoxide Air Quality Trend

Carbon monoxide concentrations show a fairly consistent downward trend from 1980 through 1997. Similar to other areas of the State, the trend line for the San Joaquin Valley Air Basin shows a slight increase during the late 1980s, probably related to meteorology. The maximum peak 8-hour indicator for 1997 is about half that of 1980. Measured concentrations in the San Joaquin Valley Air Basin have not exceeded the national standards since 1992, and concentrations no longer exceed the State standards. Much of the decline in ambient CO concentrations can be attributed to the introduction of clean fuels and newer, cleaner, motor vehicles.

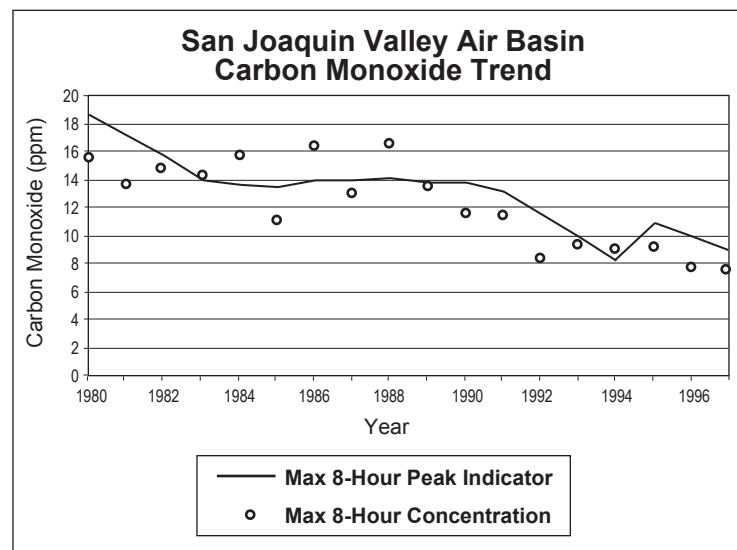


Figure 4-29

# *San Joaquin Valley Air Basin*

## Carbon Monoxide Air Quality Table

### Carbon Monoxide (ppm)

CARBON MONOXIDE (ppm)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Peak Indicator	18.6	17.2	15.7	13.9	13.6	13.4	13.9	13.9	14.1	13.7	13.7	13.2	11.5	10.0	8.3	10.9	9.9	9.0
Maximum 1-Hour Concentration	24.0	18.0	18.0	17.0	24.0	18.0	21.0	16.0	19.0	23.0	17.0	19.0	13.0	13.0	15.0	12.0	11.0	9.9
Maximum 8-Hour Concentration	15.5	13.6	14.8	14.3	15.7	11.0	16.3	12.9	16.5	13.4	11.5	11.4	8.3	9.3	8.9	9.1	7.7	7.5
Days Above State 8-Hour Standard	30	12	9	12	6	7	13	4	5	23	9	3	0	2	0	1	0	0
Days Above Nat. 8-Hour Standard	24	10	8	9	5	7	11	4	5	18	9	3	0	0	0	0	0	0

Table 4-23

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## *San Diego Air Basin*

### Introduction – Area Description

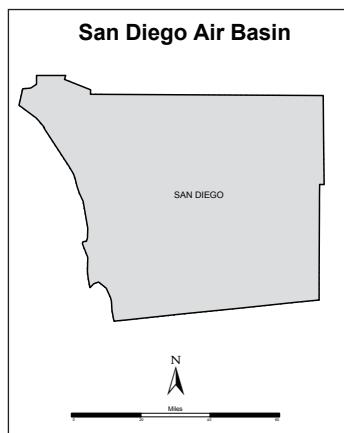


Figure 4-30

The San Diego Air Basin lies in the southwest corner of California and comprises all of San Diego County. However, the population and emissions are concentrated mainly in the western portion of the County. The Basin covers a total of 4,260 square miles. It includes about 8 percent of the State's population and produces about the same percentage of the State's criteria pollutant emissions.

Because of its southerly location and proximity to the ocean, much of

Air quality in the San Diego Air Basin is impacted not only by local emissions, but also by pollutants transported from other areas — in particular, ozone and ozone precursor emissions transported from the South Coast Air Basin. Although the impact of transport is particularly important on days with high ozone concentrations, transported emissions cannot be blamed entirely for the ozone problem in the San Diego area. Studies show that emissions from the San Diego Air Basin are sufficient, on their own, to cause violations of the ozone standards.

the San Diego Air Basin experiences a relatively mild climate that is nearly winterless.

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## *San Diego Air Basin* **Emission Trends**

Emissions of NO<sub>x</sub>, ROG, PM<sub>10</sub>, and CO in the San Diego Air Basin have been following the statewide trends since 1985. These trends are largely due to motor vehicle controls and reductions in evaporative emissions. Mobile sources (both on-road and other) are by far the largest contributors to NO<sub>x</sub>, ROG, and CO emissions in the San Diego Air Basin.

## *San Diego Air Basin* Population and VMT

Growth rates in the San Diego Air Basin during the last seventeen years were among the highest in the State's urban areas. The population increased 48 percent — from about 1.9 million in 1980 to over 2.7 million in 1997. During this same time period, the number of vehicle miles traveled each day increased nearly 89 percent — from about 37 million miles per day to more than 69 million miles per day. As in other parts of California, overall air quality in the San Diego Air Basin has improved, despite high growth rates, indicating the benefits of cleaner technologies.

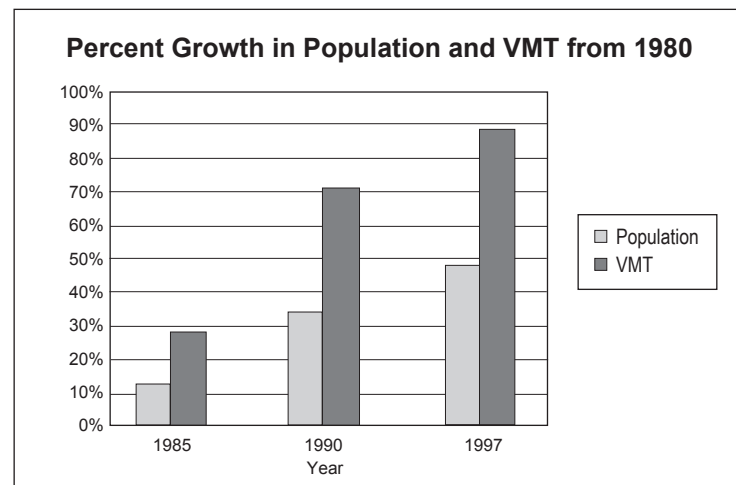


Figure 4-31

## *San Diego Air Basin*

### Ozone Precursor Emission Trends

Emissions of the ozone precursor NO<sub>x</sub> have remained relatively flat from 1985 to 1995. ROG emissions have been steadily decreasing since 1985. These decreases are mostly due to decreased emissions from motor vehicles, brought about by stricter motor vehicle emissions standards. Stationary and area-wide source emissions of ROG have remained mostly unchanged over the last 20 years, with stricter emissions standards offsetting industrial and population growth.

<b>NO<sub>x</sub> Emission Trends (tons/day, annual average)</b>			
<b>Emission Source</b>	<b>1985</b>	<b>1990</b>	<b>1995</b>
<b>All Sources</b>	<b>239</b>	<b>271</b>	<b>238</b>
Stationary Sources	16	16	16
Area-wide Sources	5	5	5
On-Road Mobile	186	215	182
Gasoline Vehicles	152	168	143
Diesel Vehicles	34	47	39
Other Mobile Sources	32	35	35

Table 4-24

<b>ROG Emission Trends (tons/day, annual average)</b>			
<b>Emission Source</b>	<b>1985</b>	<b>1990</b>	<b>1995</b>
<b>All Sources</b>	<b>350</b>	<b>323</b>	<b>278</b>
Stationary Sources	45	47	52
Area-wide Sources	42	45	49
On-Road Mobile	247	212	155
Gasoline Vehicles	243	206	150
Diesel Vehicles	4	6	5
Other Mobile Sources	16	19	22

Table 4-25

# San Diego Air Basin

## Ozone Precursor Emission Trends

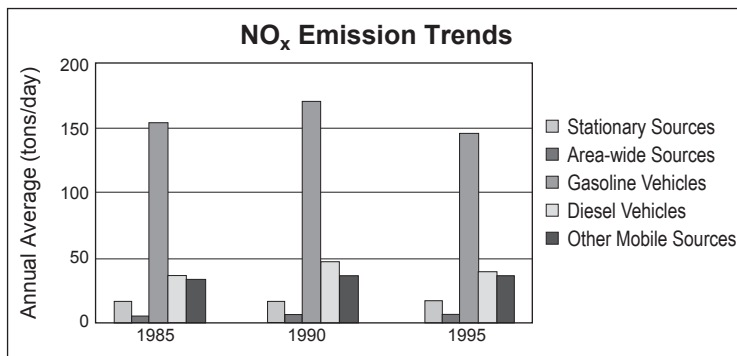


Figure 4-32

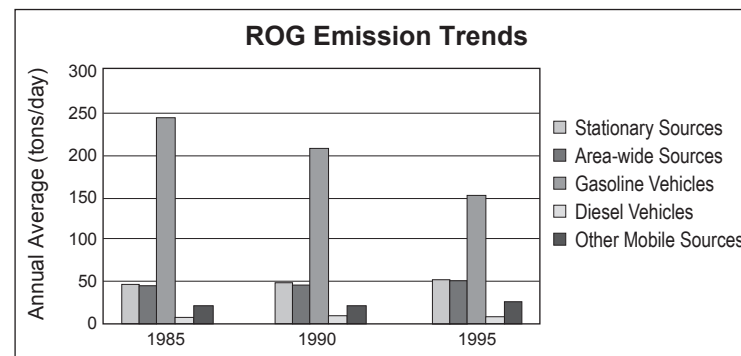


Figure 4-33

## *San Diego Air Basin* Ozone Air Quality Trend

Both the peak indicator and the number of days above the State and national ozone standards have decreased over the last 17 years. The peak 1-hour ozone indicator shows an overall decline of nearly 44 percent from 1980 to 1997. The number of State and national standard exceedance days has dropped even more. During 1980, there were 168 State standard exceedance days and 88 national standard exceedance days. During 1997, there were 43 State standard exceedance days and 1 national standard exceedance day. These drops represent decreases of about 74 percent and 99 percent, respectively. It is clear that additional local emission controls will be needed to reach attainment in the San Diego area. However, because of transport, future air quality in this area will also be affected by emission controls and growth in the South Coast Air Basin and, to some extent, Mexico.

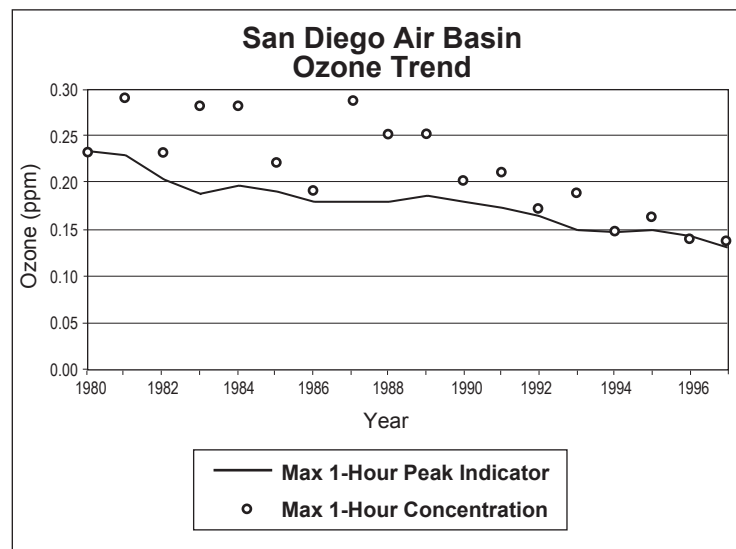


Figure 4-34

# *San Diego Air Basin*

## Ozone Air Quality Table

### Ozone (ppm)

OZONE (ppm)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Peak Indicator	0.234	0.228	0.203	0.188	0.197	0.189	0.179	0.179	0.179	0.186	0.180	0.172	0.164	0.150	0.147	0.148	0.142	0.132
National 1-Hour Design Value	0.350	0.290	0.210	0.200	0.200	0.210	0.190	0.180	0.180	0.190	0.190	0.170	0.170	0.154	0.150	0.146	0.141	0.138
National 8-Hour Design Value	0.159	0.134	0.120	0.139	0.123	0.138	0.123	0.119	0.129	0.139	0.129	0.116	0.110	0.113	0.108	0.108	0.100	0.094
Maximum 1-Hour Concentration	0.230	0.290	0.230	0.280	0.280	0.220	0.190	0.290	0.250	0.250	0.200	0.210	0.170	0.187	0.147	0.162	0.138	0.136
Maximum 8-Hour Concentration	0.174	0.206	0.163	0.176	0.208	0.169	0.144	0.196	0.156	0.194	0.145	0.145	0.134	0.154	0.122	0.123	0.118	0.112
Days Above State Standard	168	192	120	125	146	148	131	127	160	159	139	106	97	90	79	96	51	43
Days Above Nat. 1-Hour Standard	88	78	47	61	51	50	42	40	45	56	39	27	19	14	9	12	2	1

Table 4-26

## San Diego Air Basin

### PM<sub>10</sub> Emission Trends

Direct emissions of PM<sub>10</sub> have increased by 25 percent in the San Diego Air Basin between 1985 and 1995. This increase was due to growth in emissions from area-wide sources, primarily fugitive dust sources, including vehicle travel on unpaved and paved roads, and construction and demolition operations.

PM <sub>10</sub> Emission Trends (tons/day, annual average)			
Emission Source	1985	1990	1995
<b>All Sources</b>	<b>79</b>	<b>94</b>	<b>99</b>
Stationary Sources	6	7	7
Area-wide Sources	64	78	85
On-Road Mobile	7	7	5
Gasoline Vehicles	3	2	2
Diesel Vehicles	4	5	3
Other Mobile Sources	2	2	2

Table 4-27

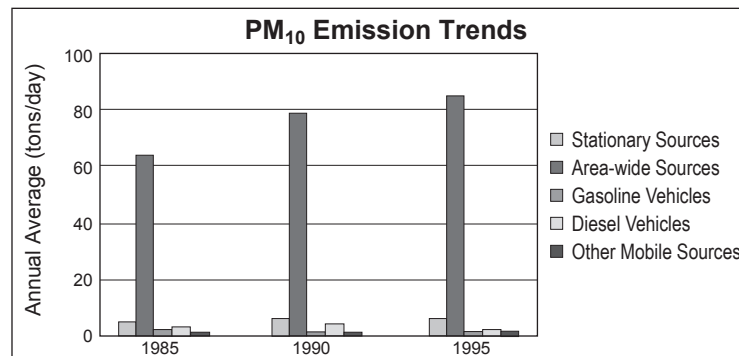


Figure 4-35

## *San Diego Air Basin* **PM<sub>10</sub> Air Quality Trend**

PM<sub>10</sub> concentrations in the San Diego Air Basin have changed little during the years for which reliable data are available. The maximum annual geometric mean for 1997 is actually higher than it was during 1980, because of monitoring at a new site. The maximum annual geometric mean still exceeds the State annual PM<sub>10</sub> standard. The 24-hour concentrations also exceed the State 24-hour standard; however, they are well below the level of the national standard. During 1988, there were 18 State standard exceedance days, compared with 22 during 1997. The year-to-year variability in the 24-hour statistics is a reflection of both meteorology and the 1-in-6-day sampling schedule. Although ambient PM<sub>10</sub> concentrations in the San Diego Air Basin are not as high as in some other areas of the State, they still exceed the State standards. As a result, additional emission controls will be needed to bring this area into attainment.

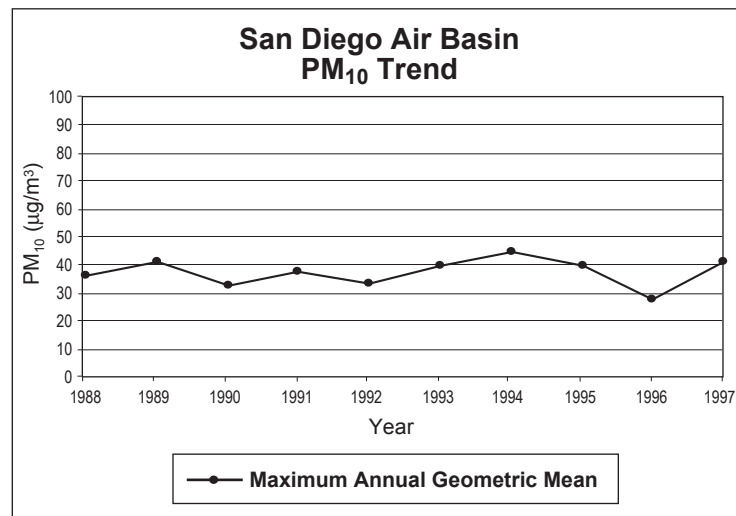


Figure 4-36

## *San Diego Air Basin*

### PM<sub>10</sub> Air Quality Table

PM<sub>10</sub> (µg/m<sup>3</sup>)

PM <sub>10</sub> (µg/m <sup>3</sup> )	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Maximum 24-Hour Concentration									81	90	115	81	67	159	129	121	93	125
Maximum Annual Geometric Mean									36.8	41.3	33.4	38.0	33.5	40.0	45.2	39.8	28.4	41.9
Days Above State 24-Hour Standard									18	28	11	20	7	27	25	23	16	22
Calc. Days Above Nat. 24-Hour Std.									0	0	0	0	0	6	0	0	0	0

Table 4-28

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## San Diego Air Basin

### Carbon Monoxide Emission Trends

CO emissions in the San Diego Air Basin follow the statewide trend of decreasing from 1985 to 1995 even though motor vehicle miles traveled are increasing. Once again, the adoption of more stringent motor vehicle controls has had a positive impact on CO emissions.

CO Emission Trends (tons/day, annual average)			
Emission Source	1985	1990	1995
<b>All Sources</b>	<b>2264</b>	<b>2190</b>	<b>1711</b>
Stationary Sources	12	13	14
Area-wide Sources	62	69	73
On-Road Mobile	2070	1968	1452
Gasoline Vehicles	2055	1941	1426
Diesel Vehicles	15	27	26
Other Mobile Sources	120	140	172

Table 4-29

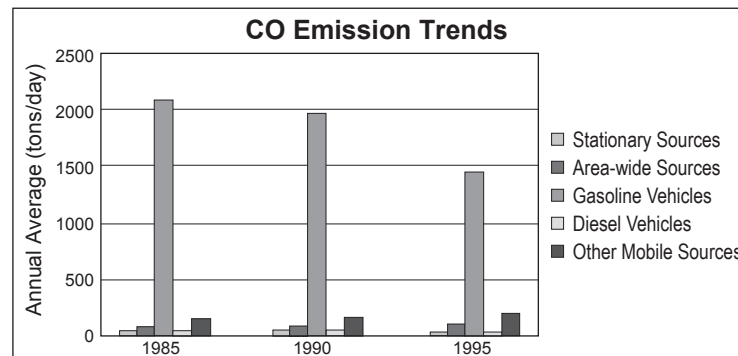


Figure 4-37

## *San Diego Air Basin*

### Carbon Monoxide Air Quality Trend

Peak 8-hour carbon monoxide concentrations in the San Diego Air Basin decreased substantially over the trend period — a 44 percent decrease from 1980 to 1997. As a result of these decreases, the national CO standards have not been exceeded in the San Diego Air Basin since 1989. The last exceedance of the State standards occurred during 1990.

With existing and anticipated motor vehicle and clean fuels regulations, ambient CO concentrations should continue to decline. This should be sufficient to maintain a healthful level of carbon monoxide in this area.

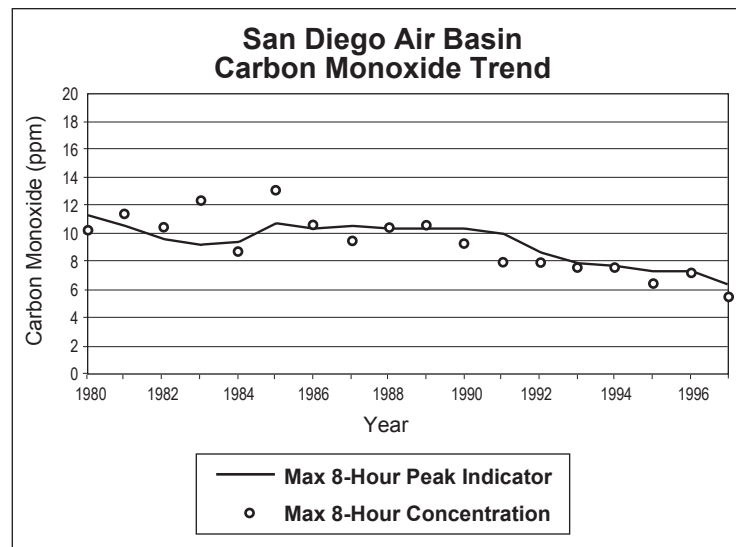


Figure 4-38

# *San Diego Air Basin*

## Carbon Monoxide Air Quality Table

### Carbon Monoxide (ppm)

CARBON MONOXIDE (ppm)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Peak Indicator	11.3	10.5	9.5	9.2	9.4	10.6	10.2	10.4	10.2	10.3	10.2	10.0	8.5	7.8	7.7	7.3	7.3	6.3
Maximum 1-Hour Concentration	15.0	15.0	15.0	16.0	16.0	17.0	16.0	14.0	17.0	17.0	18.0	14.0	14.0	11.4	11.0	9.9	12.4	9.3
Maximum 8-Hour Concentration	10.1	11.3	10.3	12.1	8.5	13.0	10.4	9.4	10.3	10.5	9.1	7.9	7.9	7.5	7.5	6.3	7.1	5.3
Days Above State 8-Hour Standard	1	1	1	1	0	5	2	1	5	6	1	0	0	0	0	0	0	0
Days Above Nat. 8-Hour Standard	1	1	1	1	0	3	1	0	2	5	0	0	0	0	0	0	0	0

Table 4-30

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## San Diego Air Basin

### Oxides of Nitrogen Emission Trends

NO<sub>x</sub> (and nitrogen dioxide) emissions in the San Diego Air Basin follow the statewide trend of declining between 1990 and 1995. The continued adoption of more stringent motor vehicle and stationary source emissions standards should continue to reduce NO<sub>x</sub> emissions.

NO <sub>x</sub> Emission Trends (tons/day, annual average)			
Emission Source	1985	1990	1995
<b>All Sources</b>	<b>239</b>	<b>271</b>	<b>238</b>
Stationary Sources	16	16	16
Area-wide Sources	5	5	5
On-Road Mobile	186	215	182
Gasoline Vehicles	152	168	143
Diesel Vehicles	34	47	39
Other Mobile Sources	32	35	35

Table 4-31

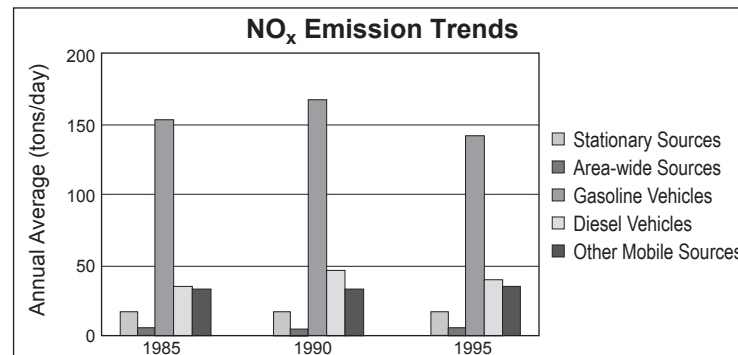


Figure 4-39

## *San Diego Air Basin*

### Nitrogen Dioxide Air Quality Trend

In the past, the San Diego Air Basin had a nitrogen dioxide problem. Maximum 1-hour concentrations during the 1980s occasionally exceeded the ambient air quality standards. However, data show that the maximum peak 1-hour indicator decreased 46 percent from 1980 to 1997. Ambient concentrations are now well below the levels of both the State and national standards, and the San Diego Air Basin is in attainment for these standards.

Because oxides of nitrogen ( $\text{NO}_x$ ) emissions contribute to ozone, as well as to nitrogen dioxide, many of the ozone control measures help reduce ambient  $\text{NO}_2$  concentrations. Furthermore,  $\text{NO}_x$  emission controls are a critical part of the ozone control strategy, and are not expected to be relaxed in the future. As a result, these controls should assure continued attainment.

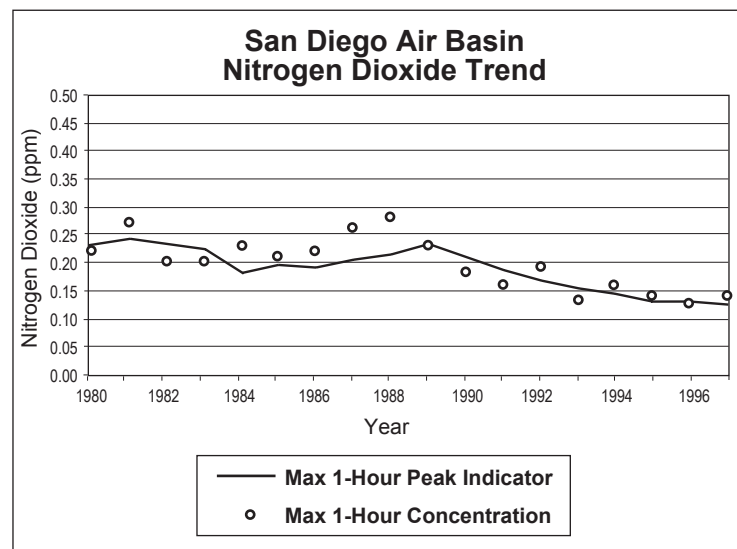


Figure 4-40

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*San Diego Air Basin*  
**Nitrogen Dioxide Air Quality Table**  
**Nitrogen Dioxide (ppm)**

NITROGEN DIOXIDE (ppm)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Peak Indicator	0.233	0.245	0.234	0.225	0.183	0.194	0.193	0.204	0.217	0.233	0.211	0.189	0.169	0.155	0.146	0.130	0.129	0.126
Maximum 1-Hour Concentration	0.220	0.270	0.200	0.200	0.230	0.210	0.220	0.260	0.280	0.230	0.180	0.160	0.190	0.130	0.157	0.140	0.124	0.142
Maximum Annual Average	0.035	0.043	0.030	0.027	0.031	0.032	0.034	0.032	0.035	0.038	0.029	0.029	0.027	0.023	0.024	0.026	0.022	0.024

Table 4-32

## *Sacramento Valley Air Basin*

### Introduction – Area Description

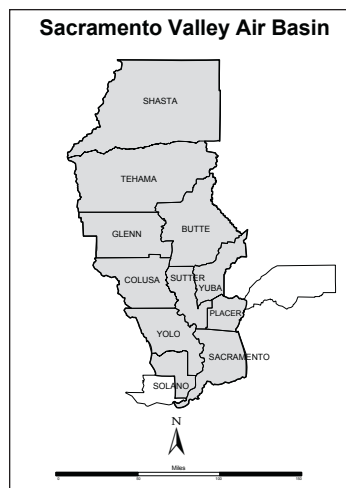


Figure 4-41

The Sacramento Valley Air Basin is home to California's State capital. Located in the northern portion of the Great Central Valley, the Sacramento Valley Air Basin includes Butte, Colusa, Glenn, Sacramento, Shasta, Sutter, Tehama, Yolo, and Yuba counties, the western urbanized portion of Placer County, and the eastern portion of Solano County. The Sacramento Valley Air Basin occupies 15,040 square miles and has a population of more than two million people. Because of its inland

or South Coast Air Basin. The winters are generally wet and cool, while the summers are hot and dry.

Emissions from the Sacramento metropolitan area dominate the emission inventory for the Sacramento Valley Air Basin, and on-road motor vehicles are the primary source of emissions in the metropolitan area. While pollutant concentrations have generally declined over the years, additional regulations will be needed to attain the State and national ambient air quality standards.

location, the climate of the Sacramento Valley Air Basin is more extreme than the climate in the San Francisco Bay Area Air Basin

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## *Sacramento Valley Air Basin* **Emission Trends**

The emissions levels in the Sacramento Valley Air Basin have been trending downward over the last five years, with the exception of PM<sub>10</sub> emissions. The decreases in NO<sub>x</sub>, ROG, and CO are largely due to motor vehicle controls and reductions in evaporative emissions. On-road motor vehicles are by far the largest contributors to NO<sub>x</sub>, ROG, and CO emissions in the Sacramento Valley. PM<sub>10</sub> emissions sources include fugitive dust sources such as vehicle travel on paved and unpaved roads.

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## *Sacramento Valley Air Basin*

### Population and VMT

Between 1980 and 1997, population in the Sacramento Valley Air Basin grew at a higher rate than the statewide average — a 45 percent increase compared with a 39 percent increase statewide. Meanwhile, the increase in the number of vehicle miles traveled each day was also higher than the overall statewide value — an 86 percent increase in the Sacramento Valley Air Basin compared with a 78 percent increase statewide. While the actual population and VMT totals for the Sacramento Valley Air Basin are much smaller than those for the South Coast Air Basin and San Francisco Bay Area Air Basin, they are important because motor vehicles are a significant source of emissions in the Sacramento Valley Air Basin.

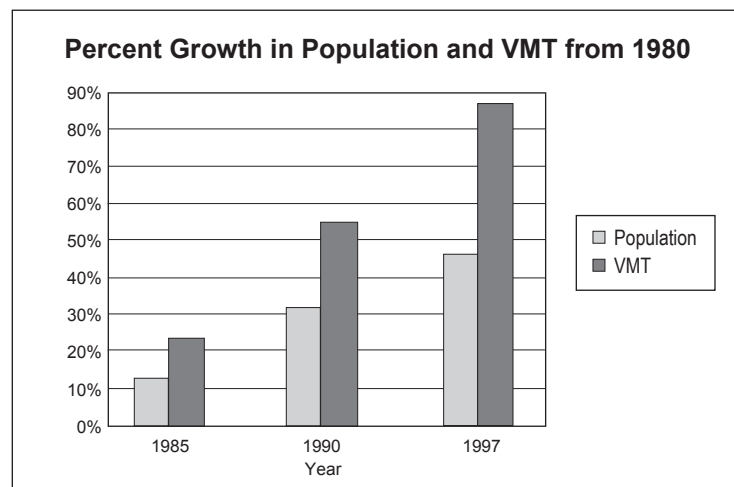


Figure 4-42

## *Sacramento Valley Air Basin* Ozone Precursor Emission Trends

Emissions of NO<sub>x</sub> have decreased since 1990. On-road motor vehicles are by far the largest contributor to NO<sub>x</sub> emissions, with other mobile sources following. ROG emissions have been decreasing for the last fifteen years due to more stringent motor vehicle standards and new rules for control of ROG from various industrial coating and solvent operations.

NO <sub>x</sub> Emission Trends (tons/day, annual average)			
Emission Source	1985	1990	1995
<b>All Sources</b>	<b>270</b>	<b>294</b>	<b>266</b>
Stationary Sources	23	24	27
Area-wide Sources	6	6	7
On-Road Mobile	190	208	175
Gasoline Vehicles	138	147	129
Diesel Vehicles	52	61	46
Other Mobile Sources	51	56	57

Table 4-33

ROG Emission Trends (tons/day, annual average)			
Emission Source	1985	1990	1995
<b>All Sources</b>	<b>376</b>	<b>351</b>	<b>308</b>
Stationary Sources	45	48	50
Area-wide Sources	74	78	82
On-Road Mobile	234	198	145
Gasoline Vehicles	228	190	140
Diesel Vehicles	6	8	6
Other Mobile Sources	23	27	30

Table 4-34

## Sacramento Valley Air Basin

### Ozone Precursor Emission Trends

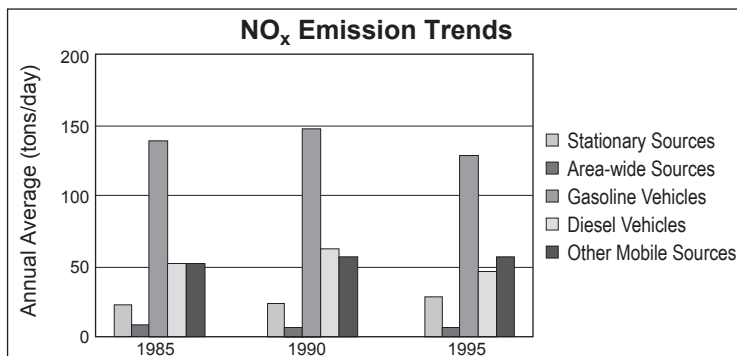


Figure 4-43

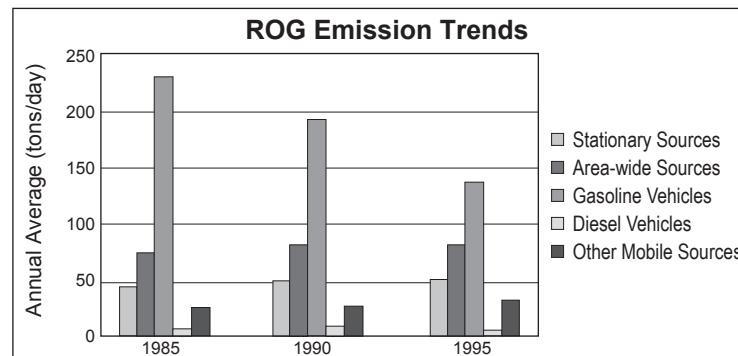


Figure 4-44

## *Sacramento Valley Air Basin* Ozone Air Quality Trend

Peak ozone values in the Sacramento Valley Air Basin have not declined as quickly over the last several years as have ozone concentrations in other urban areas. The maximum peak values remained fairly constant during most of the 1980s. Since 1988, the peak values have decreased slightly, and the overall decline for the 17-year period is about 22 percent. Looking at the number of days above the State and national standards, the trend is much more variable. However, the number of exceedance days has generally declined since 1988. The number of exceedance days increased slightly during the mid-1990s. However, this upswing may be due more to meteorology than actual emission increases. Based on the data, it is apparent that additional emission controls will be needed to bring the area into attainment for the State and national standards.

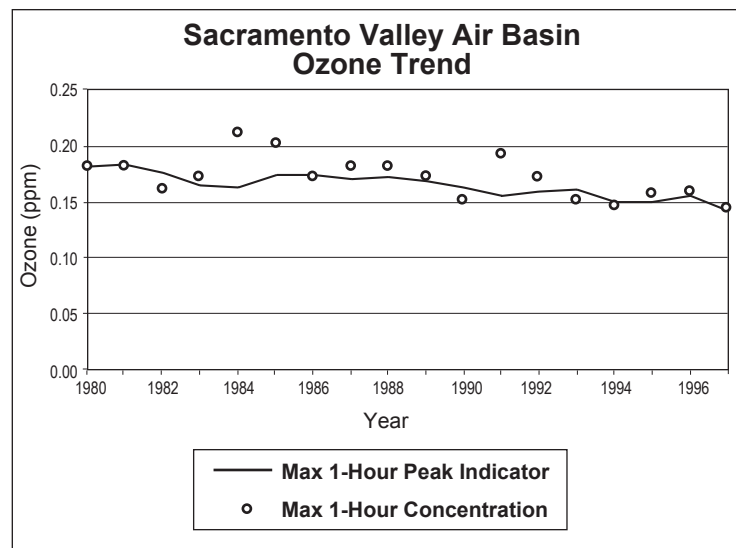


Figure 4-45

# *Sacramento Valley Air Basin*

## Ozone Air Quality Table

### Ozone (ppm)

OZONE (ppm)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Peak Indicator	0.180	0.181	0.175	0.163	0.162	0.173	0.173	0.168	0.170	0.166	0.162	0.153	0.158	0.159	0.148	0.149	0.154	0.141
National 1-Hour Design Value	0.190	0.170	0.160	0.160	0.180	0.180	0.180	0.160	0.160	0.160	0.160	0.150	0.150	0.150	0.143	0.145	0.145	0.133
National 8-Hour Design Value	0.115	0.120	0.116	0.113	0.124	0.126	0.113	0.113	0.125	0.105	0.118	0.123	0.111	0.104	0.106	0.112	0.104	0.091
Maximum 1-Hour Concentration	0.180	0.180	0.160	0.170	0.210	0.200	0.170	0.180	0.180	0.170	0.150	0.190	0.170	0.150	0.145	0.156	0.157	0.143
Maximum 8-Hour Concentration	0.133	0.143	0.133	0.125	0.138	0.161	0.125	0.128	0.130	0.134	0.128	0.140	0.123	0.120	0.122	0.129	0.126	0.108
Days Above State Standard	73	78	66	62	64	59	66	94	98	67	50	68	74	34	60	50	58	25
Days Above Nat. 1-Hour Standard	19	22	17	15	23	19	24	24	35	8	16	14	14	7	9	11	9	3

Table 4-35

## Sacramento Valley Air Basin

### PM<sub>10</sub> Emission Trends

Direct emissions of PM<sub>10</sub> have increased in the Sacramento Valley Air Basin between 1985 and 1995. This increase was due to growth in emissions from area-wide sources, primarily fugitive dust sources. Emissions of directly emitted PM<sub>10</sub> from mobile sources and stationary sources have remained relatively steady.

PM <sub>10</sub> Emission Trends (tons/day, annual average)			
Emission Source	1985	1990	1995
<b>All Sources</b>	<b>195</b>	<b>222</b>	<b>236</b>
Stationary Sources	11	12	13
Area-wide Sources	172	198	214
On-Road Mobile	9	9	6
Gasoline Vehicles	1	2	2
Diesel Vehicles	8	7	4
Other Mobile Sources	3	3	3

Table 4-36

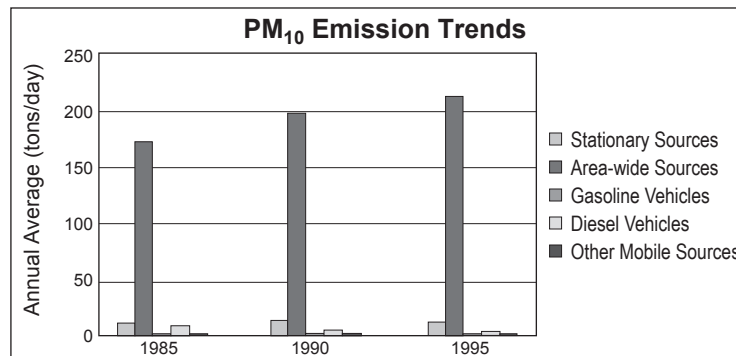


Figure 4-46

## *Sacramento Valley Air Basin* **PM<sub>10</sub> Air Quality Trend**

The maximum annual geometric mean PM<sub>10</sub> concentrations in the Sacramento Valley Air Basin show a fairly steady decline over the trend period. The maximum annual geometric mean shows a decrease of about 31 percent from 1988 to 1997, when the value was below the level of the State annual standard. The number of exceedance days also decreased. During 1988, there were 33 State standard exceedance days, compared with 11 days during 1997. The national 24-hour PM<sub>10</sub> standard has not been exceeded since 1987. PM<sub>10</sub> data for the Sacramento Valley area exhibit a pattern that is typical of many areas in California, where the 24-hour PM<sub>10</sub> standards are usually achieved before the annual standards. Because many of the sources that contribute to ozone also contribute to PM<sub>10</sub>, future ozone emission controls should improve PM<sub>10</sub> air quality.

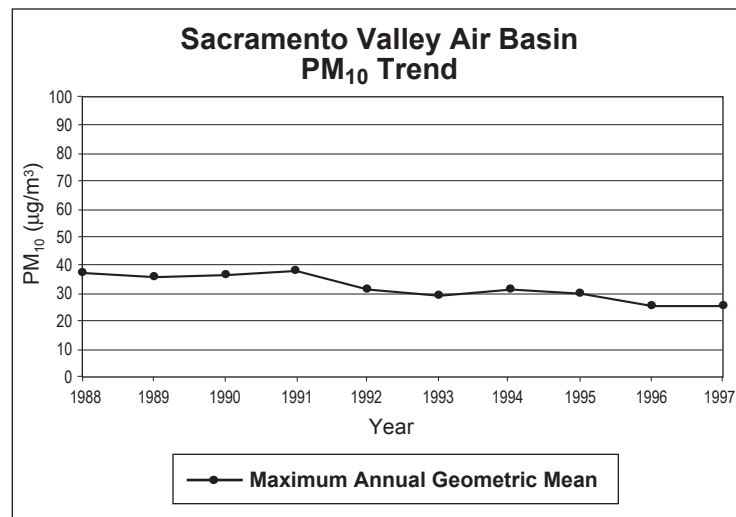


Figure 4-47

## *Sacramento Valley Air Basin*

### PM<sub>10</sub> Air Quality Table

PM<sub>10</sub> (µg/m<sup>3</sup>)

PM <sub>10</sub> (µg/m <sup>3</sup> )	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Maximum 24-Hour Concentration									115	139	153	136	111	118	154	145	98	126
Maximum Annual Geometric Mean									36.7	35.6	36.0	37.7	31.4	28.8	31.1	29.5	25.5	25.3
Days Above State 24-Hour Standard									33	25	42	49	37	26	24	36	28	11
Calc. Days Above Nat. 24-Hour Std.									0	0	0	0	0	0	0	0	0	0

Table 4-37

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## Sacramento Valley Air Basin

### Carbon Monoxide Emission Trends

Emissions of CO have been declining in the Sacramento Valley Air Basin. Motor vehicles are the largest source of CO emissions. With the introduction of new automotive emission controls, emissions from motor vehicles have been declining since 1985, despite increases in vehicle miles traveled.

CO Emission Trends (tons/day, annual average)			
Emission Source	1985	1990	1995
<b>All Sources</b>	<b>2399</b>	<b>2382</b>	<b>1957</b>
Stationary Sources	24	28	30
Area-wide Sources	329	390	409
On-Road Mobile	1875	1765	1291
Gasoline Vehicles	1854	1734	1262
Diesel Vehicles	21	31	29
Other Mobile Sources	171	199	227

Table 4-38

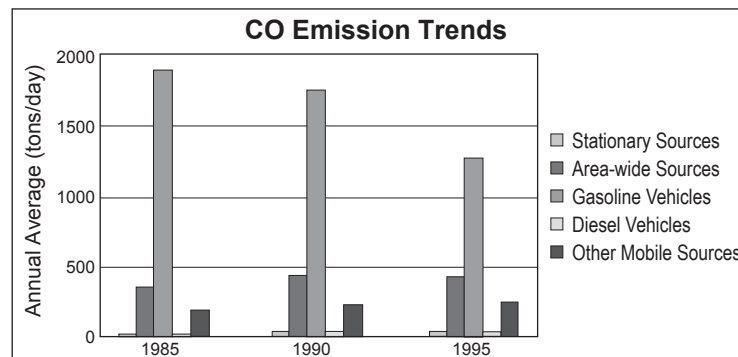


Figure 4-48

## *Sacramento Valley Air Basin* Carbon Monoxide Air Quality Trend

The maximum peak 8-hour carbon monoxide trend for the Sacramento Valley Air Basin was relatively flat from 1981 to 1991, with some year-to-year variability that was probably caused by meteorology. Since 1991, concentrations have decreased substantially. The 1997 value was about 48 percent lower than the 1991 value. The number of days above the State and national standards is even more variable. However, these indicators also show an overall downward trend. The national CO standards have not been exceeded since 1991, and the State standards were last exceeded in 1993. Much of the decline in ambient carbon monoxide concentrations is attributable to the introduction of Cleaner Burning Gasoline and newer, cleaner motor vehicles. These controls will help keep the area in attainment for both the State and national CO standards.

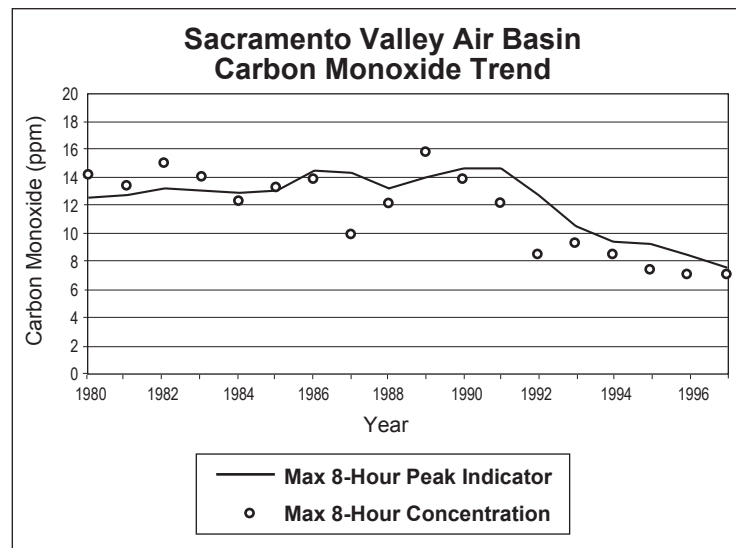


Figure 4-49

# *Sacramento Valley Air Basin*

## Carbon Monoxide Air Quality Table

### Carbon Monoxide (ppm)

CARBON MONOXIDE (ppm)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Peak Indicator	12.7	12.9	13.4	13.2	13.0	13.1	14.6	14.4	13.4	14.1	14.7	14.8	12.9	10.7	9.6	9.3	8.5	7.7
Maximum 1-Hour Concentration	18.0	17.0	17.0	19.0	18.0	17.0	20.0	15.0	17.0	18.0	17.0	15.0	14.0	12.0	10.8	9.8	8.7	9.5
Maximum 8-Hour Concentration	14.3	13.5	15.1	14.1	12.4	13.3	13.9	10.0	12.3	15.9	14.0	12.3	8.6	9.4	8.5	7.4	7.2	7.2
Days Above State 8-Hour Standard	10	7	11	6	6	12	12	4	11	19	14	8	0	2	0	0	0	0
Days Above Nat. 8-Hour Standard	9	7	10	3	5	11	11	3	9	18	12	6	0	0	0	0	0	0

Table 4-39